North Pacific Ocean and Japan

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(Addenda, 1908)

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SUPPLEMENT

TO THE THIRD EDITION OF

Findlay's Sailing Directory

FOR THE

NORTH PACIFIC OCEAN

AND JAPAN,

WITH REVISED DESCRIPTIONS OF THE

COASTS, ISLANDS, ETC.

D.

H. F. Hillier

By W. R. KETTLE, F.R.G.S.

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ADDENDA

For the Third Edition of

FINDLAY'S DIRECTORY FOR THE NAVIGATION OF THE NORTH PACIFIC OCEAN.

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Pages xi.-xxxii.—**GEOGRAPHICAL POSITIONS.**—More recent and accurate observations, with the aid of telegraphy, have fixed the positions of several other places, which will therefore serve as *secondary meridians*. They are distinguished in the following Table by being printed in CAPITALS.

Page.	Place.	Lat. N.	Long.	Authority.
		° ′ ″	° ′ ″	
			W.	
xii.	SAN JUAN DEL SUR, Signal Station -	11 14 45	85 52 59½	U.S. Telegraphic, 1889.
	LA LIBERTAD, inshore end of iron wharf	13 28 48⅔	89 19 19⅓	,, ,, ,,
	SALINA CRUZ, Summit of Morro de Salinas - - - - - - -	16 9 36	95 12 16	,, ,, ,,
xiv.	SAN FRANCISCO, Presidio Observatory	37 47 48¼	122 27 12	,, ,, &c.
xv.	ESQUIMALT, Duntze Head flagstaff -	48 25 49	123 25 54	Telegraphic, 1898.
xviii.	Mount St. Elias, 18,017 feet - -	60 17 34½	140 55 19½	Boundary Survey, 1892.
			E.	
xxiii.	TOKYO, Observatory - - -	35 39 17½	139 44 30	
	Yokohama, Time Signal Station -	35 26 41	139 39 0	
	INU-BO-YE-SAKI, Lighthouse - -	35 42 13	140 52 22	Telegraphic, 1894.
			W.	
xxvi.	Washington Island, Observation Spot	4 43 0	160 24 30	H.M.S. *Penguin*, 1897.
	Palmyra Island, Observation Spot -	5 52 15	162 5 0	,, ,, ,,
xxvii.	Likieb Island, 5 cables within N.E. point - - - - - - -	9 49 32	E. 169 18 25	Dr. Hayn, 1895.
	Jaluit, W. coast, 1½ cable within North point - - - - - -	5 55 8	169 38 39½	,, ,, ,,
	Arrecifos Islands, West end of atoll -	9 50 0	160 48 20	U.S.S. *Alliance*, 1900.
	Port Lélé, anchorage - - - -	5 20 6	163 0 45	,, ,, ,,
	Pingelap Islands, East end - -	6 14 0	160 38 43	,, ,, ,,
	Ponapi, Peytick Islet, Jamestown Hr.	7 0 35	158 12 21	,, ,, ,,
xxix.	GUAM, Obs. Spot, near Tel. Cable Station - - - - - - -	13 26 22¼	144 38 51¾	U.S. Telegraphic, 1903.
xxx.	HONOLULU, Observation Spot, Navy Station - - - - - - -	21 18 23¾	W. 157 51 55½	,, ,, ,,
	MIDWAY ISLANDS, Obs. Spot, near Cable Station - - - - - -	28 12 52	177 22 44¼	,, ,, 1904.

Pages 1-5.—**CENTRAL AMERICA.**—Commerce, on the Pacific coast of the Central American isthmus, has made but comparatively little progress of recent years; though more attention has recently been devoted to this region, chiefly in connection with the various canal and railway schemes for connecting the Pacific and Atlantic shores, particulars of which are given hereafter, in the sections where they occur. More recent particulars and statistics of the various republics are also given in their appropriate positions.

Page 6.—**PANAMA,** formerly one of the nine Departments of Colombia, secede from that republic in October, 1903, with the support of the United States (in connection with the proposed new Panama Canal scheme), and was proclaimed an independent republic. On the Pacific coast, its eastern boundary is in the little Bay of Aguacate or Octavia, on the eastern side of Cape Marzo, in about lat. 6° 50′ N.; its western boundary is at Point Burica (see Addenda for pages 31—32). It has an area of about 33,500 square miles, and the population numbers about 350,000.

Panama is the only port open to foreign commerce on its Pacific coast. The currency, formerly having as its unit the paper *peso* or *dollar* of 10 *reals* (worth about 1*s.* 6*d.*), is now founded on the gold *balboa* or *dollar* of 100 cents, equivalent to the U.S. dollar, the silver *peso* or dollar being valued at half a gold dollar, and there are also silver coins of 50, 20, and 10 cents. The official weights and measures are metric, but the old Spanish system is in general use. The *arroba*, *quintal*, and *carga* are equivalent, respectively, to 12½, 50, and 125 kilogrammes. The *libra* = 1·10lb. av., and the *vara* = 80 centimètres.*

Page 6.—**The GULF of PANAMA** is situated in the hot Equatorial belt of calms and variable winds, rendering its navigation usually very tedious for sailing vessels, which sometimes spend two or three weeks, or more, in getting up or down. The currents are variable, and squalls and rain are frequent.

Pages 6-7.—**SAN MIGUEL BAY** forms the approach to Darien Harbour, into which flow the Rivers Savannah and Tuyra, and other smaller streams. The survey of 1893 shows considerable changes since the previous survey. The channel northward of *Buey Bank* has 4 fathoms water in it. The least depth in the fairway, up to Darien Harbour, is 8 fathoms at low water.

The shores of *Darien Harbour* are lined with mangrove, above which wooded hills rise from 100 to 300 feet. The productions of the Tropics could here be raised in abundance, and the climate is fairly healthy. Plenty of fresh water can be obtained at the village of *Palma*, southward of which the harbour is shallow.

Page 7.—**Tuyra River** is navigable for a considerable distance by vessels of light draught. The steamer from Panama ascends it as far as *El Real*, about 40 miles above Palma; at 21 miles beyond this are the gold-mines of *Cana*, actively worked, at an elevation of 2,200 feet.

Page 7.—**PEARL ISLANDS.**—The pearl fishery is leased by the Government; in 1903, the yield was valued at £14,000.

Page 9.—**Gonzales Island** has a telegraph cable station on it.

Page 10.—**San Jose Island** has some curious high rocks eastward of its South end and vessels should give this side of the island a wide berth. The swell breaks heavily on it.

Pages 10-11.—**The Coast,** between Trinidad River and Panama, is low, and covered with mangrove, except at the bluffs at the mouths of the Rivers Chiman and Chepo. It is fronted by extensive banks of mud.

Page 11.—**Chepo or Bayamo River** has only 2 feet over its bar at low tide. The Central American isthmus is here at its narrowest, being 37 miles in width; and it has been proposed to connect the Mandinga River, flowing into the Gulf of San Blas on the Atlantic side, with the Bayamo, by a ship canal. This would be a straight cut at sea-level, 27 miles in length, for 23 miles passing through low flat country, but the remaining 4 miles would have to be tunnelled through a mountain ridge 1,200 ft. high. The cost is estimated at £22,000,000.

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* The old Spanish system of *Weights* and *Measures* is still in use in the Central American Republics and Mexico, the following being the principal, though they may vary slightly, as above :—

Libra = 0·46 kilogramme,	or 1·014lb. av.	*Fanega* = 1½ Imperial bushel.	
Arroba = 25 libras,	or 25·357 ,,	*Vara* = 0·837 mètre,	or 2 ft. 9 inches.
Quintal = 46·02 kilo.,	or 101·40 ,,	*Legua* = 6,666⅔ varas,	or 5,580 yards.

Pages 11-13.—**PANAMA** now contains about 20,000 inhabitants, and the city has tramways, and the electric light. Plans have been made to bring a supply of fresh water by pipes from Juan Diaz River, 14 miles distant; at present, the inhabitants are dependent upon rain-water. Several lines of steamers call here regularly, and there is communication with the telegraph system. Steamers can obtain supplies of Welsh, Australian, and other coal, from hulks, or by lighters carrying 150 to 250 tons. Two hospitals are maintained, and will admit seamen. Cargo is landed and shipped by means of lighters.

The railway wharf has been extended, and landing is now more easy, except near low water. Heavy boats can only approach the shore near the time of high water.

Light.—The *fixed red* light on the railway wharf is only shown occasionally. The city front is illuminated by electric lights, the highest of which, elevated 42 ft., on the S.E. bastion, was utilised as a leading light by the mail steamers. It can be distinguished on rounding Taboguilla Island, and will be obscured by San José Rock.

Time Signal.—The clock at the telegraph office daily signals the instant of noon, of the 75° meridian West of Greenwich (standard time for the Panama Canal zone), and ships' chronometers can be compared with it.

There is a government wireless telegraph station on the canal zone.

Panama exports chiefly bananas, cattle, rubber, pearl-shell, hides, mahogany, sarsaparilla, tortoise-shell, cocobolo, ivory-nuts, ipecacuanha, and balsams, given in their order of importance, and valued at £212,220 in 1898, the last year for which figures are available. The imports were valued at £722,468. Trade is chiefly carried on with the United States, the ports open to foreign commerce being Panama, Colon, and Bocas del Toro.

Climate, &c.—At Panama, the wet season commences in April or May, and lasts till November, rain falling nearly every day, except about the end of June, when there is a short cessation, known as the *Veranito de San Juan.* At this season, the mean temperature varies from 75° to 87° F., and the heat is very oppressive, owing to the humidity and prevailing light southerly winds or calms. Heavy thunderstorms are frequent.

During the rest of the year, or dry season, strong northerly and N.W. winds prevail, and the temperature varies between 80° and 83°. At this season, the wind has been observed to rise and fall with the tide; this peculiarity is also observed during the wet season, there being then usually a dead calm at low tide.

Visitations of yellow fever are occasionally experienced here, and leprosy is also stated to be increasing. The U.S. authorities enforce strict quarantine regulations on vessels arriving.

Earthquakes have not been of common occurrence during recent years. That of September 7, 1882, caused a great deal of damage to the cathedral and other public and private buildings.

Page 13.—**The Railway** is 48½ miles in length, and now belongs to the Canal works. The present fares for transit are 4 dollars gold 1st class, and 4 dollars silver 2nd class. As stated previously, the pier has been extended, and the *light* is only shown occasionally.

Pages 13-14.—**The PANAMA CANAL** has proved a veritable "Maelström" to the reputation of its original projectors, and to the vast wealth, mainly of French origin, which has so far been fruitlessly lavished over it. A considerable amount of work has been done at the approaches at each end, and also on the route across the isthmus, nearly half of the work of excavation having been accomplished; but owing to mismanagement, waste, and peculation, at an exaggerated cost. In 1890, the liquidator of the original Company issued his report, showing a total expenditure of over £53,000,000, of which about £31,250,000 was spent at the isthmus, £15,500,000 in Paris, £3,700,000 over the purchase of the railway, while the French press received over £800,000.

Work was commenced in the autumn of 1879, and, long before the suspension of the works in 1889, it was seen that the scheme of a canal without locks would have to be abandoned. The plans were then modified for the construction of a canal with eight locks, crossing the Culebra at an elevation of 133⅔ feet. In 1894, a new Company was formed in Paris, to take over the works and the railway, with the object of proving that the completion of the work was feasible, and it executed some amount of work on the canal route.

In 1899, the United States appointed a Commission of eminent engineers, etc., to determine the most feasible and practical route for a ship canal across the Central American isthmus, and their Report was issued in 1901. The Darien, Panama, and Nicaragua routes were all carefully examined, but only the two latter could be considered as possible. In June, 1902, the United States Senate and House of Represen-

tatives decided to undertake the completion of the Panama Canal, at the national expense, at a total estimated expenditure of £30,000,000. Satisfactory terms were arranged with the Colombian and Panama governments,* and in April, 1904, the new Canal Company parted with their property for a sum of £8,000,000, then paid over by the United States government.

The canal proper will be 42⅓ miles long, approached at either end by a dredged channel, with a least depth of 35 feet throughout. Chagres River, the chief obstacle, will be impounded by a colossal dam, forming a lake with an area of over 40 square miles, eastward of the Culebra. This would be reached by means of two locks on the eastern side, and three on the West, with a lift of about 90 feet above sea-level, should it be decided not to attempt to cut the canal at sea-level.

The Panama Canal will offer no attraction, in saving of distance, over the Suez Canal route between Europe and Eastern Asia, Japan, Australia, etc., but it would greatly lessen the distance on voyages to the western coasts of the American continent. Thus, from England to Yokohama the distance by steamer is about 11,000 miles viâ Suez, and 12,650 miles viâ Panama; while to San Francisco it is about 13,500 miles viâ Magellan Strait, and 7,800 miles viâ Panama. From New York to Panama it is about 11,000 miles viâ Magellan Strait, and not much over 2,000 miles by the proposed canal; while to San Francisco it is about 13,200 miles and 5,300 miles, respectively.

PORT ANCON, formerly called *La Boca*, about 2½ miles westward of the city of Panama, is the mouth of the Rio Grande, and the southern approach to the canal. A covered wharf, 985 ft. long, has been constructed here, with a depth of 26¼ ft. alongside at low water springs, over soft mud. It is connected with the railway, and is furnished with cranes, etc., for dealing with weights up to 24 tons. Off the wharf a large area has been dredged to 29 ft. at low water, where vessels of the largest size can always lie afloat. A channel, 3½ miles long, has been dredged from sea to Port Ancon, with a depth of 20 ft. at low water, which is being increased to 21 feet.

Pages 14-15.—The dredged channel to Port Ancon passes close northward of *Perico* and *Ilenao* or *Naos Island*, the dredgings being deposited westward of the latter, thus closing the former channel on that side. Large vessels can safely anchor, in 4 to 5 fathoms, close to the north-eastward of Perico, the current from the Rio Grande having increased the depth hereabout. The U.S. mail company's works are on *Ilenao*, and vessels drawing up to 19 ft. can lie alongside the coal-hulk at low water. Coal is brought off in lighters to vessels lying outside.

Page 15.—*Knocker Rock* is now marked by a *red can buoy* on its S.E. side, lying nearly 1 mile East of the S.E. bastion. The edge of the shoals near Taboga Rock was also marked by two buoys, but none of the buoys can be depended on.

Tides.—In 1893, the officers of the U.S.S. *Alliance* reported that between Taboguilla Island and San José Rock the flood stream ran very strongly, setting the vessel nearly 1 mile westward of her course.

Page 16.—**Taboga Island** abounds with fruit, and near the village of *Restingue*, facing the Morro, is a spring of good water, whence vessels can be supplied. Near the village of *Taboga* is a large sanitarium, erected by the original Canal Company. The gridiron could take a vessel drawing 11 ft., at high water springs, but repairs are rarely undertaken, except for the mail steamers.

Pages 18-19.—**MONTIJO BAY** is now coming into prominence as a port for the export of cattle, hides, maize, and tobacco, and we are indebted to Capt. J. A. R. Jones, of the mail steamer *Chiriqui*, for the following information. In entering by the eastern channel, pass well eastward of the sunken *English Rock*, lying about 1 mile off the eastern end of Cebaco Island. Vessels can anchor in 4 to 9 fathoms, at *Perdomo* anchorage, off San Pedro River entrance.

Puerto del Campo, opposite the eastern end of Leones Island, is a place for shipment of cattle, situated on a deep but narrow river.

San Pedro River, running into the northern end of Montijo Bay, can be ascended by vessels drawing up to 11 ft., and 100 ft. long, to *Remolinos*, about 13 miles up, and boats can reach *Montijo*, 7 or 8 miles farther up. Supplies can be obtained at *Pena*, about 6 miles up the river.

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* The Republic of Panama ceded to the United States a zone of territory extending 5 miles on each side of the canal, and consequently including the city of Panama. The boundary between the respective territories is at Mala Point, whence it passes through a pole beacon on the centre islet of Los Hermanos, and a buoy will mark the prolongation of this line seaward.

San Pablo River runs into the N.W. angle of Montijo Bay, and can be ascended by similar vessels for about 23 miles, as far as *Baranco Colorado;* and a vessel drawing 10 ft. has reached *Soná*, about 9 miles higher up.

Local knowledge is necessary for the navigation of these narrow rivers.

Page 19.—**Lorenzo Bay,** 4 miles westward of Brava Point, is a small indentation fronted by several islets. Steamers ship mahogany from the town at its head.

Page 19.—**COIBA or Quibo Island** abounds with mahogany and cedar. *Fea Harbour* is the inlet between the reefs in the southern angle of *Damas Bay*, with depths of 5 or 6 fathoms. At its head is the settlement of *Guadia*, where supplies of rice, maize, fruit, and fish may be obtained.

Page 20.—**Hicaron**.—In 1903, Capt. Afredberry, of the steamer *San Juan*, stated that the height of this island is about 1,400 feet, from observations made on four consecutive voyages past it.

Widow Rock, awash at low water, lies in the channel between Rancheria and Afuera Islands, at 2 miles N. 85° E. from the eastern point of Rancheria.

Pages 23-25.—**PUERTO NUEVO** must be approached southward of Silla and Insolita Islands, the northern channel, between Insolita and Espartal Islands, having silted up. According to Capt. Jones, of the steamer *Chiriqui*, the depths in the port are irregular and liable to change, but not less than 12 feet should be found in the fairway at low water, as far as the rivers running into its head.

Rio Santa Lucia or *Remedios*, running into the N.W. angle of Puerto Nuevo, can be ascended at high water by vessels drawing 11 feet, for 2½ miles, to *San Juan Enfiente*, where cattle are shipped. Smaller vessels can reach the port of *Remedios*, about 11 miles higher up.

Page 23.—**Prosper Rock** has a reef extending about 1 cable S.E. from it, sometimes uncovered at low water springs.

Page 26.—**The Chiriqui Coast** is very unhealthy, fevers being very prevalent, especially from June to November, and often resembling yellow fever, The following information concerning it is derived from Capt. Jones, of the steamer *Chiriqui*.

Page 27.—**Palenque and Parida Anchorages,** between Juco Point and Parida Island, 11 miles to W.S.W., are embarrassed by numerous islets and rocks, but the chart will prove a guide for avoiding them.

Page 28.—The *Boca Chica*, passing eastward of Brava Island, is now rarely used, being shallow and tortuous. *Boca Brava*, between Brava and Sevillia Islands, is approached from the anchorage near the N.E. end of Parida Island, whence a boat may be sent to examine it at low water. The channel frequently changes, but it has been used by vessels drawing up to 13½ feet. It is the usual approach for vessels bound to the port of *Horconcitos*, where cattle are shipped, and provisions are plentiful; not less than 3 fathoms will be found in the fairway after crossing the bar. Vessels drawing up to 12 ft. can reach Pedregal by an intricate passage northward of the islands.

Page 29.—*Grono Rock*, a pinnacle with 6 ft. over it, is reported to lie about 3½ miles S.W. by S. ¼ S. from Santa Cruz Point, the S.W. extreme of Parida Island. In 1895, the captain of the steamer *Casma* reported seeing breakers in this position.

David Bay lies westward of Parida Island. In its N.E. part is the *Boca San Pedro*, passing westward of Sevillia Island, deeper than the Boca Brava, but exposed to a heavy sea from the S.W. It passes between breakers extending at least 2 miles off shore, but has depths of 4 fathoms or more, and when within San Pedro Point there is convenient anchorage in 4½ or 5 fathoms. At high water, vessels drawing up to 13 ft. can reach *Pedregal*, about 10 miles up the river, by a narrow winding channel; this is the port of the town of *David*, which contains about 5,000 inhabitants, and exports cattle in large numbers.

Page 30.—**Montuosa Island**.—In 1902, the officers of the U.S.S. *Concord*, by cross-bearings of other islands, found the centre of Montuosa to be in about lat. 7° 29′ N., long. 82° 13′ 30″ W., or about 2½ miles N.E. ¼ N. from its position on the chart. In 1905, it was reported to lie 2½ miles S.W. ⅝ S. from its position on the U.S. chart. The reef, partly dry, extends 3 miles westward (not N.W.) from it.

Pages 31-32.—**COSTA RICA**, the most peaceful and settled of the Central American republics, has an area of about 23,000 square miles, with an estimated population of 331,340 in 1905. Its eastern boundary, as fixed in 1900 by arbitration of the French President, is the mountain chain running down the promontory of Point Burica, the island off the latter belonging to Panama. Its western boundary, separating it from Nicaragua, is the centre of the shores of Salinas Bay. San José is the capital, and Puntarenas the only port on the Pacific coast.

Its coast is now more accurately delineated on the chart, having been surveyed by the officers of the U.S.S. *Ranger*, in 1885.

The chief articles of export are coffee, bananas, cedar, hides, fustic, rubber, cacao, mother-of-pearl, etc., valued at £1,388,995 in 1904, and the fertile soil yields the products of the Tropics in profusion, including medicinal plants, mahogany, ebony, rosewood, and dyewoods. Among its minerals are gold, silver, copper, iron, and lead, but only the two former have been worked to any extent. The climate is healthy, considering its tropical position. The dry season lasts from November to May ; thence to the end of October is the wet season.

In 1900, Costa Rica inaugurated a gold currency, with the silver *colon* or *condor* as the unit, of which 10·40 to 10·90 are equivalent to £1. The weights and measures are on the metric system (see the note for page 6).

Page 32.—**The GULF of DULCE** is rarely visited by merchant vessels, its shores being very sparsely inhabited.

Page 33.—*Santo Domingo* now contains about 200 inhabitants. It was visited, in January, 1898, by the German barque *Papa*, for a cargo of cedar, which Capt. Thöm says was inferior to that of the Gulf of Nicoya. The *Papa* lay in 15 fathoms, half a mile off shore, and experienced rainy and calm weather.—(See *Annalen der Hydrographie*, October, 1898, pp. 407-408).

Page 35.—**Ubita or Uvita Bay** affords anchorage in 6 to 8 fathoms, behind the reef extending off Point Ubita. There are some conspicuous huts on the islet off the point, forming a good mark.

Page 35.—**Naranjo** is a shipping place for cedar, close westward of the Quepos Islets, with a few huts near the entrance of the Rio Naranjo, where fresh water can be obtained. According to Herr Karow, of the German barque *Dione*, 1897, there is anchorage in 6 to 7 fathoms, about 1 mile off-shore, but it is advisable to moor, if shipping timber, owing to the swell. No supplies can be obtained here, there being no permanent inhabitants, but wild pigs are plentiful.—(*Annalen der Hydrographie*, March 1898, pp. 102-104).

Page 37.—**The GULF of NICOYA** is a magnificent sheet of water, extending 50 miles in a N.W. direction, and surrounded by beautiful scenery. Its western shores are fronted by islands, rocks, and reefs, among which the currents run strongly. The eastern shore is comparatively free from dangers. The climate is very hot, but during the dry season, from November to May, the heat is tempered by the winds ; in the wet season, from May to November, it is almost intolerable. In September, it sometimes rains for days together. Severe squalls from the N.W. occasionally descend the sierras. Gales mostly come from an easterly direction.

Ballena Bay, 12 miles north-eastward of Cape Blanco, has a few native inhabitants, and affords sheltered anchorage in 8 to 5 fathoms.

At 9 miles north-eastward of Ballena Bay are *Negritas Islets*, with *Sail Rock* lying eastward of them, and this should not be closely approached. To the N.W. of these is *Cedro Island*, southward of which is *Buquerones*, where there is good sheltered anchorage in 4 to 10 fathoms, mud, and shingle ballast can easily be obtained. Good fresh water can also usually be obtained from the stream at *Tamarindo*.

Farther northward is *Pan de Azucar Islet*, on the West side of which there is good anchorage in 9 fathoms, 1 cable off shore, whence good stone ballast can easily be shipped.

San Lucas Island, opposite Puntarenas, is a convict station.

Tarcoles Bay, on the eastern shore of the gulf, is fronted by reefs, and is one of the sites proposed for the terminus of the railway from San José ; *Tivives*, 9 miles farther N.W., is another.

Pages 38-40.—**PUNTARENAS,** the only port of entry on the Pacific coast of Costa Rica, now contains about 2,600 inhabitants, and is situated on a sandspit 3 miles in length. Steamers, running between Panama and San Francisco, call here regularly. In 1904, the vessels entering numbered 88, with a tonnage of 165,231. A considerable pearl-shell fishery is carried on. *San José*, the capital of Costa Rica, is now connected with Port Limon, on the Atlantic coast, by railway, but the extension to Puntarenas is still far from completion ; the journey to San José, a distance of about 73 miles, can now be made in one day. In the dry season, from December to May, when coffee is shipped, and business most active, sailing vessels may experience considerable delay in loading or discharging cargo. A pilot will come off, if required, but pilotage is not compulsory.

There is a roofed iron pier 425 ft. long, but only accessible to lighters, etc. The *light* is shown on its extremity, but is reported to be an ordinary lantern light, not easily distinguished from the lights of the shipping or the town.

Provisions are now stated to be mostly scarce and expensive, but fruit, etc., are plentiful. Brackish water is brought off in lighters, if wanted. The port dues are subject to alterations.

Page 40.—**Punta Culebra,** 18 miles north-westward of Puntarenas, is an anchorage abreast *Chira Island*, sometimes visited for shipping the timber and dyewcods brought down the *Rio Tempisque*, which runs into the head of the gulf. Fresh meat could here be had from the village of *Colorado*, and good water from the *Rio Avangares* or the Tempisque.

Page 40.—**The Coast** has since been surveyed by officers of the United States Navy.

Page 41.—*Guionos Point*, 40 miles N.W. by W. ¾ W. from Cape Blanco, has sunken rocks extending 1 mile off it, and should be given a wide berth, as the N.W. current runs swiftly at times, often setting on shore northward of the point. *Piedra Blanca*, 10 miles eastward of it, is a whitish rock, at half a mile eastward of which is a small bay, with depths of 5 to 8 fathoms, but a reef projects half a mile off its western point.

Northward of Guionos Point are several dyewood and timber-shipping places, only visited occasionally, such as *Venao;* and *Pitahaya*, in about lat. 10° 5′ N. At *Lagastos* the anchorage is very insecure. *Pargos*, in about lat. 10° 12′ N., is another insecure anchorage, with bad holding ground, which Capt. Gille, of the German barque *Inca*, 1889, says should be avoided in October, the worst month on this coast. The local pilots must not be trusted implicitly.

Cape Velas is in lat. 10° 21½′ N., long. 85° 53½′ W., and immediately within it rises *Morro Hermoso*. *Barca Quebrada*, close eastward of the cape, is a shipping place for timber, the anchorage, in 5 to 6 fathoms, sand, being somewhat sheltered by *Captain Islet*. Capt. Bachmann, of the barque *Victoria*, 1898, says this is a very dangerous anchorage, 3 miles S.S.E. of Cape Velas, surrounded by reefs; he anchored in 7½ fathoms, 3 miles off shore, and was exposed to a heavy rolling sea.

Braxilito Bay, 5 miles N.E. of Cape Velas, affords fairly secure anchorage in 6 to 8 fathoms. No fresh water could be obtained here. *Potrero Bay*, next N.E. of Braxilito Bay, has anchorage in 5 fathoms, in its N.E. part, where vessels come to load dyewood. In the vicinity are other loading places, *Santa Elena*, *Santa Catalina*, and *Puerto Hiacho*.

Santa Catalina Island, lying off this coast, rises steeply to an elevation of 231 feet, and forms a good mark. A rocky bank extends 2½ miles S.E. from it. *Brumel Islets* lie off a projecting point S.W. of *Gorda Point*, and not off the latter.

Page 42. —**Matapalo,** 2 miles eastward of Gorda Point, is a shipping place for cedar, with anchorage in 7 fathoms, and under. Good fresh water can usually here be easily obtained from a stream.

Cocos Bay, 2 miles N.E. of Matapalo, is the chief loading place for dyewood on the coast of Costa Rica, and affords good anchorage in 6 to 7 fathoms, but a dangerous coral reef extends half a mile off the house standing near its centre. To avoid this, keep near the southern shore in entering. Fresh water can be had here.

PORT CULEBRA is said to be the finest harbour on the whole coast between San Francisco and Cape Horn, but is all but uninhabited. It has moderate depths of water, over mud and sand, affording completely sheltered anchorage to vessels of the largest size. Supplies of fruit and poultry might be had from the few inhabitants. *Higuanita*, at the upper end of the port, is a timber shipping place, off which there is anchorage in 5 fathoms.

Cabujal, 7 miles northward of Port Culebra, is a loading place for timber, with good anchorage in 11 fathoms, mud.* At 1½ mile farther northward is *Carbonal*, with similar anchorage off it.

Page 43.—**Port Elena** is a fine landlocked harbour, entered through a break in the cliffs on the South shore of Elena Bay. Water can be obtained from several streams.

Page 44.—**Cape Nathan** has a steep rock, 88 ft. high, lying 6 cables off it, to W. by N.

Page 44.—**NICARAGUA** has an area of about 50,000 square miles, the population being estimated at 420,000. It is bounded on the South by Costa Rica, and on the North by Honduras, the latter frontier being northward of the Estero Real, in the Gulf of Fonseca. Its forests produce rubber, mahogany, cedar, and other timber, while the fertile soil yields bananas, coffee, cacao, and other tropical produce. Gold

* In 1902, Capt. Fretwurst, of the barque *Java*, reported that he coast is much more indented North of the point in lat. 10° 40′ N., long. 85° 41′ W., than shown on the U.S. chart, and the creek entrance much farther southward. A dangerous 9-ft. rock lies about 2½ cables N.N.E. of the point, and a 4-ft. patch near it.

and silver appear among the minerals. The exports, valued at £730,458 in 1903, are chiefly coffee, bananas, gold, rubber, cattle, hides, and timber. The ports open to commerce on the Pacific coast are San Juan del Sur and Corinto, the greater part of its trade being carried on through the latter, which is connected with Lakes Managua and Nicaragua by railway. *Managua*, the capital, now contains about 20,000 inhabitants. The currency is silver or paper, and the weights and measures metric—(see the note for page 6).

Pages 45, 48, 49.—Nicaragua came into prominence as the alternative route for a ship canal across the Central American isthmus. Work was commenced in 1890, at San Juan del Norte, or Greytown, on the Atlantic coast, a breakwater being constructed here, and the dredged canal begun, but the works were ultimately abandoned.

According to the latest scheme, a canal would be dredged through the low country westward of Greytown, and the upper waters of the San Juan River and the Lake of Nicaragua reached by means of three locks, attaining an elevation of 110ft. above sea-level at mean tide. The waters of the San Juan would be impounded by a huge dam at Ochoa, the river thus forming the channel to the lake; in the latter a channel would be dredged, as necessary, to the Rio Lajas, on the western shore. Thence a canal would be excavated to the basin of Tola, to be formed by another dam, thence descending, by means of three locks, to the Pacific coast at Brito.*

The total distance, from ocean to ocean, is 183½ miles, of which 27 miles would have to be excavated. The cost was estimated at £38,000,000, and the time necessary to carry out the works at 6 to 8 years. This scheme, however, has now been definitely abandoned, by the adoption of the completion of the works of the Panama Canal (see Addenda for pages 13-14).

Pages 45-47.—**SAN JUAN del SUR** is but a village, containing about 350 inhabitants; it appears to be decreasing in commercial importance, and supplies and fresh water are scarce. In 1903, the vessels entering numbered 55, with a tonnage of 99,651. It is situated in the S.E. part of the bay, and is connected with the town of *Nicaragua* or *Rivas*, 10 miles distant, by a road. The mail steamers call here regularly, and four telegraph cables (from Panama, Salinas, and Libertad) are landed on the East shore of the bay, their position being marked by buoys, the outermost lying 6 cables W. by N. ½ N. from the lighthouse. Vessels must not anchor northward of the buoys. Cedar and logwood are shipped here.

Light.—On the summit of the hill, rising over the South side of the bay, stands a white pyramidal tower 46 ft. high, showing a *fixed bright* light, elevated 480 ft., and visible about 8 miles seaward between S. 35° W. and N. 55° W. It must not be depended on.

Page 48.—**Brito.**—See the Addenda for page 45.

At 6 miles N.W. of Brito is *Gigante Point*, forming a small open bay, where there is anchorage in 10 fathoms. Vessels come here to load timber and dyewood.

Venadillo, in lat. 11° 55′ N., is a loading place for cedar, off which there is open anchorage in 7 to 14 fathoms, with Mount Momotombo bearing N. ½ E.

Vessels are advised not to approach the coast within 3 miles, between Cape Desolado and Tamarinda River, as it appears to be very foul for about 2 miles off.

Page 49.—*Industrie Rock*, of 2 fathoms, is now considered to be a danger lying only about half a mile off shore, in lat. 12° 8½′ N. It could not be found in the reported position when closely searched for by the U.S.S. *Ranger*.

The LAKE of NICARAGUA has an area of about 3,000 square miles, and appears to be subject to changes of level, varying between 97 and 110 ft. above sea-level at mean tide.

Page 50.—**Leon** now contains about 50,000 inhabitants, and the railway has been extended to *Managua*, the capital, and thence to *Granada*, on the Lake of Nicaragua.

Pages 51-56.—**CORINTO** is now the principal port of Nicaragua, and contains about 1,400 inhabitants. The exports are chiefly coffee and dyewood. Steamers call regularly; in 1903, the vessels entering numbered 151, with a tonnage of 257,142. Provisions are usually dear, and English coal cost £3 a ton, in 1903. Vessels in ballast, or loading, pay 10 cents per ton register as port dues, and 20 cents per ton if entering with cargo. Pilotage costs 1½ dollar per foot of draught, in or out. The village of *Realejo* is almost deserted, the harbour and other officials now being stationed at Corinto.

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* See "The Key of the Pacific" by Archibald R. Colquhoun, 1895, for a complete account of the proposed canal

Page 53.—**Lights.**—The light on Cardon Head is obscured landward between N. 11° E. and S. 56° E.; it cannot be relied on. About 200 yards N.W. of *Cape Austro*, the S.E. point of Cardones Island, is a wooden look-out tower, where a *fixed bright* light is shown, visible 14 miles.

Page 54.—*Cardon Channel*, the principal entrance to the harbour, is only about 120 yards wide, and vessels are only allowed to enter or leave between 4h. a.m. and 6h. p.m. In 1899, it was reported that *Sawyer Bank*, on its North side, had extended at least 100 yards westward. There is a conspicuous large new building on *Icacos Point*.

The best outer anchorage is in 6½ to 8 fathoms, with Cardon Head lighthouse bearing E. by N. In the winter months, the Papagayo season, sailing vessels bound in often have to wait for days for a favourable wind to enter, S.W. winds being then infrequent, and often of short duration.

In 1898, the officers of H.M.S. *Leander* stated that when Cardon Head lighthouse appears on with Corinto church (like a white monument among the trees) bearing E.N.E., and distant 1½ mile, a course N.E. ½ E. will lead across the bar in the best water, 4½ fathoms at low water. Vessels anchoring are advised to moor.

In February, 1905, the officers of the U.S.S. *Bennington* reported that the water had shoaled in places to 3 fathoms or less, for several miles out, with a constant shifting of the bar at the entrance, and of those in the river up to and off the town. Consequently, great caution must be exercised in approaching.

Page 57.—**Manzana Island** is now known as *Limon* or *Bubosa*. About 2 miles westward of it is *Burra Grande Reef*, on which a conspicuous wreck was lying in 1900.

A 2¾-fathoms shoal is reported to lie about 1¼ mile off shore, at 6 miles S.E. of Coseguina Point. This is supposed to be the danger on which the steamer *Starbuck* struck in 1899, reported as 10½ miles south-eastward of Coseguina Point, and 4 miles off shore; the officers of the U.S.S. *Marblehead* could find no trace of it in or near the latter position, and local pilots, etc., say it does not exist there.

Pages 57-58.—**HONDURAS** is a republic, with an area of 46,250 square miles, its population, at the partial census in 1902, being estimated at about 400,000, mostly aboriginal. On the Pacific side, it has a coastline of about 60 miles, all on the Gulf of Fonseca, the boundary between it and Nicaragua being the Rio Negro, and between it and Salvador the Rio Goascoran. *Tegucigalpa*, the capital, contains about 12,600 inhabitants, and a good road is being made to the coast. Amapala is the port of entry on the Pacific coast. Its fertile soil yields the usual tropical products, and it abounds with minerals, including gold, platinum, silver, coal, etc. In the year ending June 30, 1904, the exports were valued at £443,569, chiefly bananas, silver, cattle, hides, and various natural products. The currency is based on the silver dollar or *peso*; the metrical system of weights and measures is authorised, but the old Spanish system still prevails (see the note for page 6).

The inter-oceanic railway at present extends only from Puerto Cortez to La Pimienta, a distance of 60 miles. Tegucigalpa is connected with the Pacific coast at La Brea by a road, but it is proposed to construct a railway to San Lorenzo.

Page 58.—More accurate observations give the elevation of *Coseguina Volcano* as 2,830 ft.; *Conchagua* or *Amapala Volcano* has two summits, of which the higher is elevated 4,293 feet. Both these volcanos are extinct. *Conchaguita Island* is 1,680 ft. high, and *Manguera* 1,660 feet.

Page 60.—**Chicarene Point** had two huts on it, and it is proposed to build a light-house here. According to the officers of H.M.S. *Amphion*, 1898, a spit extends 150 yards S.E. from it, with 9 fathoms near its extremity. Between this and the reef extending 3 cables off the S.W. point of Punta Sacate Island, the channel is less than 4 cables wide, and is subject to a strong tide-race. The N.W. point of Punta Sacate Island bearing N. 8° E. leads through the channel, clear of the race and Sacate Reef.

Colima Shoal, of 3¼ fathoms, lies 9¼ cables N. 28° W. from Chicarene Point, and must be avoided by large vessels bound to La Union.

Pages 60-62.—**LA UNION**, a port of Salvador, contains about 2,500 inhabitants, and is visited regularly by mail and other steamers. The exports are chiefly coffee, sugar, hides, dyewood, and balsam. Supplies of beef, poultry, oysters, fruit, etc., can usually be obtained. Fresh water can be taken from a stream accessible to boats only at high water, but it can be got more easily at 1 mile southward of Chicarene Point. Ballast can be taken from the beach. The hospital will admit seamen. The pier is 603 ft. long, reaching into a depth of 4 or 5 ft. at high water, and can be used between half-flood and half-ebb; at other times it cannot be approached. The proposed railway, through the central part of Salvador (not Costa Rica), has not yet been commenced.

Light.—The light is weak and often not exhibited.

The harbour, being landlocked, is usually very hot, but is said to be fairly healthy. The best anchorage is in about 5 fathoms, with the church bearing S.W. In the dry season, from October to May, strong northerly winds are sometimes experienced here; and in the wet season, from May to October, heavy easterly squalls.

Page 62.—**Tigre Island.**—In 1901, Capt. Paessler, of the steamer *Totmes*, reported that he found a 3½-fathoms shoal lying 6 cables S. ⅛ E. from the western extreme of Caracolito or Knob Islet (*Der Pilote*, 1902, page 141). A dangerous sunken pinnacle rock lies about 1 cable off the West side of Knob Islet, past which the ebb tide sometimes runs 2 to 3 knots; in 1903, the captain of the steamer *Silesia* found 3 fathoms over it, and it was marked by a *buoy*. Vessels bound to Amapala pass about 1½ cable or more westward of this islet, the channel between which and the western bank is only about 2½ cables wide, with about 4 fathoms least water.

AMAPALA, the Pacific port of Honduras, is situated on the N.W. side of Tigre Island, at the foot of the mountain, and contains about 1,500 inhabitants. Mail and other steamers call here regularly, and a service of small steamers connects it with La Brea and San Lorenzo, on the mainland. In 1900, the vessels entering numbered 110, with a tonnage of 169,000 The exports are chiefly gold, silver, coffee, and hides. Supplies, except poultry, are scarce, and the wells sometimes run dry. There is an iron landing pier, 400 ft. long, reaching into 5 ft. at low water.

The harbour will afford sheltered anchorage to the largest vessels, the best place being off the pier, in 6 to 8 fathoms. The tidal streams are weak.

The ESTERO REAL runs into the southern angle of the shallow bight north-eastward of Coseguina Volcano. Vessels come here to ship dyewood, and those waiting to enter find sheltered anchorage eastward of Monypenny Point, whence the river is approached by keeping about 1 mile off the southern shore. The bar has a depth of 2½ fathoms at low water, and the river can easily be ascended as far as *Remolinas*, about 21 miles up, the channel having depths of 5 to 8 fathoms, with space for vessels 165 ft. long to swing. About 8 miles up the river is *Playa Grande*, the customs station.

Tampisco, or *Tampesque*, is situated on a creek about 1 mile below Remolinas. Good water can be obtained from a stream called *Palominas*, but fresh provisions are scarce. Capt. E. Ladewigs, of the barque *Gerd Heye*, 1888, stated that Tampisco was the only loading place on the river in communication with Corinto. Vessels usually complete loading off the river entrance, where there is anchorage in 4 to 5 fathoms, eastward of *Cape Bolinas*.

Page 64.—**SALVADOR** has an area of 7,225 square miles, the population numbering 1,006,848 by the census of 1901. *San Salvador* is the capital. The exports are chiefly coffee, indigo, balsam, sugar, silver, rubber, and tobacco. A gold currency was adopted in 1897, the unit being the silver dollar. The metric and old Spanish systems of weights and measures are both in use (see the note for page 6).

Page 65.—The coast of Salvador was surveyed by the officers of the U.S.S. *Tuscarora* and *Ranger*, in 1880 to 1884. Here the dry season lasts from November to April, and the wet season from May to October, the heaviest rain falling in July and August, though September and October are also very wet. In 1897, the officers of H.M.S. *Imperieuse*, when coasting along the shores of Salvador and Guatemala, found the currents very irregular and uncertain.

Page 66.—**PORT JIQUILISCO** was surveyed by the officers of the U.S.S. *Bennington* and *Marion*, in 1897. Its entrance is 2 miles wide, between *San Sebastian Island* on the East and *San Juan Peninsula* on the West, and within it forms a large bay, mostly occupied by low wooded islands, separated by deep but narrow channels. *Lempa Shoals*, forming the bar, extend 3 miles off the entrance, and are usually marked by breakers. At its extremity the depth is about 14 ft. at low water, and within this there is a narrow straight channel into the bay, where the tide runs strongly, sometimes 3 to 4 knots at 2 miles within the bar. San Miguel Volcano bearing N. 24° E. will lead up to the bar, at 1 mile off which the depth is about 8 fathoms. No directions can be given for entering, and vessels bound here should telegraph to El Triunfo from La Union or La Libertad, when a steamer will probably come off on their arrival, to tow or pilot them in.

It is high water at the entrance, on full and change, at 2h. 38m.; springs rise 7¼ ft., neaps 4½ feet.

El TRIUNFO, opened to foreign commerce in 1893, is situated on the mainland, in the N.W. part of Port Jiquilisco, in lat. 13° 15′ 42″ N., long, 88° 33′ 4″ W., and about 10 miles above the entrance. It was founded by a company, which has the sole right of trading in the port, but the inhabitants only numbered about 270, mostly natives.

Coffee and dyewood are the chief exports. Supplies of meat, fish, and fruit could be obtained here, but water is scarce. Mail and other steamers call off the bar.

Vessels drawing 18 ft. can reach El Triunfo at any time of tide, after crossing the bar. The wharf has 13 ft. alongside at low water. There is good sheltered anchorage in 5 to 10 fathoms, in the channel leading to it.

Port Jiquilisco is not connected with Lempa River, but there is communication with the Rio San Miguel to the eastward.

Pages 67-68.—**LEMPA RIVER** has only 6 ft. over its bar at high water, but is reported to be navigable within, by small steamers, for upwards of 100 miles. From the bar *San Salvador Volcano*, 5,794 ft. high, bears N. 48° W.; *San Vicente Volcano*, 7,040 ft., N. 15° W.; and *San Miguel Volcano*, a perfect cone 7,134 ft. high, N. 62° E.

Page 68.—**Port Concordia** is about 17 miles W.N.W. of the mouth of the Lempa, but is of little importance. An iron landing pier is said to extend beyond the surf. The anchorage is very exposed, especially in the wet season.

Pages 68-69.—**La LIBERTAD** now contains about 750 inhabitants, its importance having decreased since the construction of the railway from Acajutla to San Salvador. The pier, 250 yards long, extends into a depth of 4 fathoms at low water, and is provided with steam cranes and tramways. Fresh water may be obtained from a hydrant at its extremity, and small supplies of meat, fruit, and vegetables can usually be had. Ballast is expensive. The *light*, shown for the mail steamer, is indistinct.

The usual anchorage is in 8 fathoms, over half a mile S. ½ W. from the end of the pier, but the holding ground is bad. To avoid fouling the telegraph cables, which are usually marked by buoys, vessels must not anchor eastward of a line S. by E. ½ E. from the pier. In the rainy season it is very exposed, and steamers then usually put to sea at night.

Pages 69-70.—**San Salvador** contained 59,540 inhabitants, at the census in 1901.

Page 70.—**Point Remedios** is a low wooded cliffy headland, off which a reef extends 1 mile to the S.W. *East Rock*, rising 8 ft. above high water, lies 1¼ mile S.E. of the rock close off the point, and the breakers extend 1 mile southward of it. In 1890, the steamer *Sacasa* was wrecked on a rock said to lie 2¼ miles S.E. of East Rock, and on which the sea breaks occasionally at low water. In February, 1892, the officers of H.M.S. *Champion* found the current hereabout setting 1½ knot E. by S. on to the point.

LIGHT.—A lighthouse, 30 ft. high, stands on Point Remedios, about 1¼ mile S. 75° E. from Black Rock, and shows a *fixed bright* light, elevated 73 ft., and visible 15 miles. In 1905, the steel pyramidal lighthouse tower was painted black, and not easily made out by day, but there was a small light-coloured house near it.

Pages 70-74.—**ACAJUTLA** has been recently established at a small cove about 1½ mile northward of the old pier and settlement, which have been abandoned. A new iron pier, roofed over at its extremity, here reaches into a depth of 3 fathoms at low water. The railway has been extended to *Santa Ana*, the centre of the coffee industry, and thence to *San Salvador*, a journey of about 6 hours. The exports consist chiefly of coffee and indigo. Mail and other steamers call here regularly. The fresh water is said to be unfit for drinking.

Page 72.—*Light.*—The light on the old mole is discontinued. A *fixed bright* light is shown on the new pier, but is reported to be very indistinct.

Page 73.—*Isalco Volcano*, 6,328 ft. high, is said to form a good landmark, being constantly in eruption. Bearing N.E. ½ N. it will lead in from sea, till the buildings can be made out. The best anchorage is in 6 or 7 fathoms, with the end of the pier bearing between N.E. and E.N.E., 5 or 6 cables distant.

Page 75.—**GUATEMALA** has an area of 48,290 square miles, and in 1900 the population numbered 1,574,340. *Nueva Guatemala*, the capital, now contains about 75,000 inhabitants, and the railway from Puerto Barrios, on the Atlantic coast, reaches within about 40 miles of it; it was severely damaged by earthquake on April 18, 1902. Its fertile soil yields the products of the tropical and temperate zones, while its minerals include gold, silver, copper, zinc, lead, and iron. In 1904, the exports were valued at £1,510,373, chiefly coffee (£1,295,327), timber, hides, rubber, bananas, and sugar. The currency is chiefly paper, the unit being the silver peso or dollar; there are nickel coins of 1, ½, and ¼ real. Both the old Spanish and metrical systems of weights and measures are in use (see the note for page 6).

The ports on the Pacific coast are San José, Champerico, and Ocos, but they are all open roadsteads. They are visited regularly by mail and other steamers.

Volcanos.—More recent authorities give the elevation of *Agua* as 12,334 ft.; *Fuego*, 12,603 ft.; and *Atitlan*, 11,633 feet. In April, 1902, the country was shaken from end

to end by severe earthquakes, and again in September, 1902, destroying many of the towns, and doing enormous damage to the coffee plantations.

Pages 75-76 — **TAPA.**—Works were commenced to form a harbour here, by the construction of breakwaters and a branch railway, but they were reported as practically abandoned in 1900.

Pages 77-79.—**SAN JOSE**, the chief port of Guatemala, now contains about 1,500 inhabitants, and is not easily made out, the houses being built among the trees; it was partly destroyed by fire on March 31st, 1905. The most conspicuous building to vessels approaching from sea is a large white warehouse at the inner end of the pier. It is now connected with *Nueva Guatemala*, the capital, 5,000 ft. above sea-level, by a railway 75 miles in length. Mail and other steamers call here regularly, and telegraph cables from Salina Cruz, Panama, &c., are landed half a mile eastward of the pier, which is 1,152 ft. long. There are two tugs for towing the lighters, and one of the cranes on the pier can lift a weight of 16 tons. Small supplies of fresh provisions may be had, and fresh water from artesian wells. Ballast is scarcely to be had.

Page 78.—*Light.*—The custom-house was burnt in 1905, and the light discontinued in consequence. The electric lights along the sea-front are visible far seaward.

The usual anchorage is in 11 or 12 fathoms, hard sand, over half a mile S. by E. ½ E. from the shed on the end of the pier. Vessels can also anchor in 6 to 8 fathoms, sand and mud, 1½ cable off the pier-end.

Page 80.—*Sesecapa*, about 16 miles westward of Tecojate, is a shipping place for sugar and coffee.

In February, 1904, when the steamer *Serbia* was about 10 miles south-eastward of Champerico, heavy breakers were seen extending about 2½ miles seaward of the entrance of *Samala River*, appearing to be caused by a bank forming there.

CHAMPERICO contains about 300 inhabitants, and has much increased in commercial importance, since the construction of the railway to *Retalhuleu*, a distance of 27 miles, and this is being extended towards *Quezaltenango*. The latter town was almost destroyed by the earthquake of April 18, 1902, with the loss of about 1,100 lives. The exports are chiefly coffee, hides, rubber, sugar, and tobacco. An iron pier, over 1,300 ft. long, extends into a depth of 4 fathoms, and is connected with the railway; the cranes can lift weights up to 12 tons. Supplies are said to be scarce; fresh water, from an artesian well, is brought down to the pier.

A *fixed bright light*, visible 4 or 5 miles, is shown on the end of the pier, when steamers are expected.

In approaching from sea, Champerico will be recognised by its pier and large storehouses. The usual anchorage is in 5 fathoms, sand and mud, 1½ to 2½ cables S.W. of the end of the pier. Cargo is brought off in lighters, towed by steam-launches.

OCOS, 20 miles N.W. by W. from Champerico, is now open to foreign commerce, being the westernmost port on the Pacific coast of Guatemala, and the most important of its coffee shipping ports. It is unhealthily situated on the West side of the mouth of *Ocos River*, in lat. 14° 30′ N., long. 92° 11′ W., and contains about 500 inhabitants. The exports are chiefly coffee, hides, rubber, and cedar. Mail and other steamers called regularly. A fine iron pier was constructed at Ocos, extending about 1,500 ft., into a depth of about 4 fathoms at low water, and connected with the tramway to the coffee district of Coatepeque; the cranes could lift weights up to 7 tons. Owing to the enormous quantity of volcanic ash, pumice, etc., brought down by the rivers, the pier, in 1905, was quite silted up and useless. The lighters are towed by steam-launches. But few supplies could be obtained here.

A *fixed bright light*, visible about 4 miles, was shown on the end of the pier, when steamers were expected, but on April 18, 1902, and again on September 23 and 24, severe earthquakes occurred at Ocos, destroying most of the buildings, and badly damaging the pier; it is doubtful if the light is now shown.

The usual anchorage is in 5 to 10 fathoms, hard sand, 1 to 2 miles off shore, in the line of the pier. In approaching from sea, the white shed on the end of the pier, and other buildings, will easily be made out. There were no pilots.

Capt. Paessler, of the steamer *Totmes*, 1902, states that the interior mountains are good landmarks, but are usually only clearly seen in the very early morning. He also states that the currents along this coast are irregular, sometimes setting eastward for 3 to 8 days or more, up to 1 knot an hour, and then for some days similarly westward. In consequence of this, vessels have been known to anchor off Champerico, thinking themselves off Ocos.—(*Der Pilote*, 1902, pages 149-151; 1904, pages 218-220).

At 10 miles N.W. by W. from Ocos is the mouth of the *River Suchiate*, the boundary between Guatemala and Mexico.

SOCONUSCO or San Benito, 8 miles N.W. by W. of the Suchiate, is the eastern-most port on the Pacific coast of Mexico, but is only a small unhealthy village, the port of the town of *Tapachula*, about 18 miles inland, where the ship's papers must be taken. The exports consist chiefly of coffee, cocoa, rubber, and hides. Fresh supplies, water, and ballast are scarce. A timber landing pier was erected here, but is now in ruins. Cargo is landed and shipped by means of lighters, hauled through the surf by a hawser anchored outside, and marked by black buoys, about a cable off shore.

The village is not easily made out; the shed for the lighters is visible 6 or 7 miles off, and southward of it is a green turret with a red roof, surmounted by a signal-staff. The lighthouse bearing N.E. ¼ E will lead to the anchorage. *Tacana Volcano*, a peak 14,000 ft. high, forms a good distant mark, if visible, and bearing N.E. by N. ½ N. leads in; eastward of it is another mountain, rather higher, with a double peak. The anchorage is an open roadstead, occasionally subject to a very heavy swell from N.N.W.; the stream sets alongshore, usually southward. Vessels lie in 6 fathoms, 1½ mile off shore; if necessary, they come closer in, in 5 fathoms, mud, outside the buoys. There were no pilots.

LIGHT.—A white iron tower, 69 ft. high, has recently been built at San Benito, showing a *flashing bright* light, with *two* flashes in quick succession every 5 *seconds*, elevated 74 ft., and visible 15 miles.

Pages 81-82.—**MEXICO,** a federal republic, has largely increased in commercial importance, since the extension of the railway system, and the institution of a more stable form of government. Its area is now estimated at 767,005 square miles, or a little over one-fourth of that of the United States, and at the census in 1900 the population numbered 13,545,462. The city of *Mexico*, the capital, is situated at an elevation of 7,500 ft., and contained 329,774 inhabitants. In 1904, there were 10,310 miles of railway in operation, the main lines being connected with the United States system, and this has led to a considerable transfer of trade formerly carried on at the ports on the Pacific coast. In the year 1903-4 the imports were valued at £15,661,688, and the exports at £19,669,051, the latter being chiefly silver (£7,907,489), fibres, gold, copper, coffee, hides, lead, and tobacco.

Mexico is the leading silver-producing country in the world. In 1903, the mines produced about 60,000,000 oz. of silver.

The currency is now virtually on a gold basis, the new (1904) standard unit being a *peso* or dollar of 75 centigrammes of pure gold, and the silver *peso* is legally equivalent to it. The metric system of weights and measures was made compulsory in 1895, but the old Spanish system (see the note for page 6) is still in use.

Owing to the variety of its climate, Mexico yields all the productions of tropical and temperate climes; while, in addition to its vast mineral wealth, its forests abound with mahogany, ebony, and other valuable timber. The country being mountainous, and the climate comparatively dry, there are but few rivers, and those of no commercial importance.

Pages 82-83, 85.—Our knowledge of the Pacific coast of Mexico has been considerably increased by the recent surveys made by officers of the United States Navy. It has an extent of about 4,500 miles, while that of the Atlantic coast is about 1,700 miles. The ports now open to foreign commerce, on the Pacific side, are Soconusco, Tonalá, Salina Cruz, Acapulco, Manzanilla, San Blas, Mazatlan, Altata, Guaymas, Santa Rosalia, La Paz, and Todos Santos. They are visited regularly by mail and other steamers. Heavy fines are imposed on vessels, in case of non-compliance with custom-house regulations, etc.

Uniform Buoyage.—Vessels entering ports on the West coast of Mexico must leave *black* buoys to port, and *red* buoys to starboard. Buoys painted in *horizontal bands* may be passed on either side.

Pages 83-84.—*Cordonazos de San Francisco.*—Experience has shown that these violent storms are of a cyclonic character, and have not been met with South of the fifteenth parallel of latitude. In the vicinity of the Gulf of California, their path is usually northerly. They develop rapidly, their approach being announced by a heavy southerly swell, a rising temperature, and rain increasing in violence. The barometer at first falls but slightly, and then very rapidly, a fall of six-tenths in 40 minutes having been recorded. Setting in at N.E., the wind shifts to S.E. or S.W., on the Mexican coast, increasing in violence, and may last from 2 to 8 hours. The area of the storm is generally small, and a case is recorded of a vessel with ordinary weather, while another, only 50 miles distant, was experiencing the full force of a cordonazo. At Mazatlan, they have been experienced even in January and February.

Page 85.—**MEXICAN WIND SIGNALS, etc.**—Signals are made at various places on the coast of Mexico, from a flagstaff with yard, denoting the probable direction and force of winds expected in the vicinity.

Probable Force.—A square yellow flag with a central white square :—under 18 miles an hour. White flag with central red square :—18 to 36 miles. Red flag with central black square :—over 36 miles an hour.

Probable Direction.—Square blue flag *over* force flag :—between N.N.W. and N.N.E. ; *under* force flag :—between S.S.E. and S.S.W. Red pennant *over* force flag :—between N.N.E. and E.N.E. ; *under* force flag :—between E.S.E. and S.S.E. White pennant *over* force flag :—between W.N.W. and N.N.W. ; *under* force flag :—between S.S.W. and W.S.W. Blue pennant *over* force flag :—between E.N.E. and E.S.E. ; *under* force flag :—between W.S.W. and W.N.W.

Storm Signals.—Two square red flags with central black squares hoisted vertically, or three *red* lights 5 ft. apart vertically, indicate the expected approach of a hurricane.

A triangular flag with a central black triangle, indicates bad weather to the northward. A triangular black flag with central white triangle :—to the southward.

At night :—Two *red* lights vertically indicate strong winds between N.E. and N.W. ; two *bright* lights, between S.E. and S.W. ; *bright* over *red*, between N.E. and S.E. ; *red* over *bright*, between S.W. and N.W.

Port Signals.—A red ball indicates the departure of native vessels is prohibited. A black cone, that the departure of all small vessels is prohibited. A black drum, that the port is closed to smaller vessels.

Page 86.—**GULF of TEHUANTEPEC.**—Capt. Eads' proposition for a ship railway across the isthmus has not been carried out, but an ordinary railway was completed in 1894, and is now undergoing extensive improvements, in connection with harbour works at Coatzacoalcos and Salina Cruz. It is 192½ miles in length, crosses 920 bridges, and reaches an elevation of 885 ft. above sea-level. These works were to be completed in 1905, and are now nearly in a position to deal with heavy traffic. Another line, now under construction to Oaxaca, will give railway communication with Mexico, Vera Cruz, etc.

Pages 86-87.—**Soconusco or San Benito.**—See the Addenda for page 80.

The Coast, between Soconusco and Ventosa Bay, is a low wooded beach, fronting a long range of lagoons, into which run numerous streams ; this beach is broken by a few narrow shallow inlets, fronted by breakers and frequented by sharks. Within the lagoons is a wide belt of low land, with a few hills, above which the interior mountains rise steeply to great elevations. Close to the coast, in lat. 15° 54′ N., are the *Soconusco* or *San Bernardino Mountains*, a wooded group rising to an elevation of 3,000 ft., forming a good landmark.

TONALA.—La Puerta, 10 miles W. by N. ½ N. from *Soconusco Bluff*, the S.W. extreme of these mountains, is a small village, the port of the town of Tonalá, which is about 9 miles inland. A long pier was constructed here, but it has been destroyed by the sea, and cargo is landed or shipped by lighters, which are hauled through the surf by means of a hawser, the position of which is marked by buoys. The exports are chiefly indigo, rubber, hides, and cabinet woods. Fresh and other supplies are scarce.

The anchorage is an open roadstead, where vessels lie in about 10 fathoms, good holding ground, half a mile off shore. In clear weather, *Tres Picos* or *Soconusco Volcano*, 7,945 ft. high, forms a good mark, and bearing N.E. by N. ½ N. will lead in from sea to the anchorage.

Page 87.—**Tonala Bar,** 8 miles W. by N. from La Puerta, is about three-quarters of a mile wide and has a shifting channel, sometimes used by small craft. Vessels can anchor in 11 or 12 fathoms, half a mile southward of the breakers ; the best landing for boats is on the beach, eastward of the breakers.

San Francisco Bar, or *Boca Barra*, in long. 94° 45½′ W., about half a mile eastward of a conspicuous white sandy hillock, is 3 cables wide, fronted by breakers, and is rarely accessible even to boats.

The white dome of the church at *San Mateo* forms a good mark.

Pages 87-88.—**Ventosa Bay** is shoaling fast, owing to the sediment from the river water. It has consequently been abandoned as the terminus of the railway, for which Salina Cruz Bay forms a much better approach.

Page 88.—**SALINA CRUZ BAY** is exposed to S.W. gales, but affords good anchorage in 5 to 10 fathoms, sandy mud. Its western point, the *Morro de Salinas*, is a rocky projection 241 ft. high, with a lighthouse on its summit. In approaching from sea, *Mount Shadani*, a peak 1,070 ft. high, forms a good mark ; it is 3½ miles N.W. by W.

from the bay, and has a remarkable square rock on its summit. At 1¾ miles West of Shadani is *Mount Tecuani*, with a rounded summit 2,214 ft. high.

It is unsafe to lie in the roadstead of Salina Cruz from May to October, the anchorage being so exposed to the then prevailing southerly winds and heavy S.E. swell. It is also exposed to the northers, which blow with great fury from November to March, and two or more anchors are always required. Cargo is landed and shipped by means of lighters, formerly hauled through the surf by a cable anchored outside, but now towed by a steam-tug. An iron pier was erected to facilitate shipping, but it was swept away by the sea. A temporary wooden jetty, for vessels up to 20 ft. draught, extends into 26 ft. at low water, and is partly protected by the breakwater works.

Salina Cruz now promises to become of considerable commercial importance, owing to the construction of the railway described in the Addenda for page 86, and had about 6,000 inhabitants in 1905. A dock of 70 acres is being excavated on the site of the old village, to a depth of 33 ft. at low water, the approach being protected by two breakwaters, to be completed in a few years. These breakwaters will extend about 1,600 yards south-eastward from the Morro de Salinas, and about 1,100 yards south-westward from the northern shore about midway between the Morro and Ventosa Point, and will form an outer harbour with an area of 138 acres, the entrance to be 220 yards wide. The quays will be provided with large warehouses, and a concrete graving dock 607 ft. long, with 39 ft. over the sill at high water, is under construction. Altogether, these works are estimated to cost about £6,000,000.

Enormous damage was done to the harbour works and buildings by the earthquakes of April and September, 1902, the latter being attended by a devastating cyclone.

At present, the exports consist chiefly of dyewood, indigo, hides, and coffee. Good fresh water, provisions, meat, and poultry are plentiful, but vegetables are scarce. In case of need, a small supply of coal might be had. Stone ballast can be supplied in any quantity. Steamers call here regularly, and there is telegraphic communication with all parts of the world. The electric lights are visible many miles seaward.

Tehuantepec now contains about 10,000 inhabitants.

The LIGHTHOUSE, on the Morro de Salinas, was established in 1896, but was damaged by an earthquake in 1897. It is a white stone tower, in lat. 16° 9′ 36″ N., long. 95° 12′ 16″ W., and exhibits a *flashing bright* light, a group of *three* flashes every 10 *seconds*, elevated 272 ft., and visible 23 miles. In 1903, it was reported to be irregular.

Telegraph Cables leave the shore at a hut 11 cables N.E. by E. ¼ E. from the lighthouse. One runs 3 cables S. by E. ⅛ E., and then to S.E. ¾ S.; the other runs 5 cables S. by W. ⅛ W., then to S. by E. Vessels must carefully avoid them in anchoring.

Capt. C. Wilschky, of the ship *Rodenbek*, in 1905, recommends sailing vessels bound to Salina Cruz from the South or S.E., during the season of northers (from the middle of September to the beginning of May), to steer for Ventosa Point, because at this season the wind is usually more easterly than North. In the other months, south-westerly winds prevail, and vessels should then make the land westward of the port. Pilotage is not compulsory, but a pilot will come off by day if required. A powerful steam-tug is always available.—(*Der Pilote*, 1905, Heft 29).

The Coast, between Salina Cruz and Chipegua Point, is safe to approach within 1 mile, but the projecting points are fronted by rocks. There are regular soundings over the intervening bays, but boats cannot land in *Salina Marques* and *Conejo Bays*. *Hermosa Cone*, an isolated peak 300 ft. high, rises close over the latter. *Guela-giehi Point* is a bold bluff 535 feet high.

Pages 88-89.—**Chipegua Bay** affords good anchorage anywhere, the best being in the western part. The U.S. surveyors considered it the best between La Union and Acapulco, and far superior to Salina Cruz, with better landing. *Chipegua Point* is a conspicuous headland, with a bare sand-down on its summit. Close behind it a remarkable sharp ridge rises to an elevation of 1,500 ft., sloping gradually westward. At 5 miles S.W. of Chipegua Point is a rounded bluff, covered with bushes, and off it lie two rocks 20 to 30 ft. high; about half a mile off it is a rock awash at low water, but seldom breaking at high water.

Pages 89-90.—**Morro Ayuca** is 270 ft. high, and at 14 cables N.E. ¼ E. from the N.E. extremity of Ayuca Point lies *Ranger Rock*, with 9 ft. over it, and 6 to 8 fathoms close around.

Page 93.—**Tangolatangola Island** is about 200 ft. high. Fresh water can easily be had from the stream at the head of the bay. The pearl-oyster abounds here.

Page 95.—**PORT GUATULCO.**—*Cerro Zadan* is 5,667 ft. high, and bears North (*true*) from the Piedra Blanca, distant 13½ miles.

Cacaluta Islet, 2¼ miles S.W. of the Bufadero, and 2 cables off the white sandy beach, is 220 ft. high. There is anchorage in 7 fathoms eastward of it, and good water can easily be had from a stream. Hence to Sacrificios Harbour, the coast consists of bold wooded bluffs about 100 feet high, with rocks close off them.

Sacrificios Harbour was formerly a port of Oaxaca, but is now abandoned, being only fit for small vessels.

Page 95.—**PUERTO ANGEL, or Pachutla,** is now of little commercial importance, Oaxaca being connected with the Mexican railway system. The anchorage is only an open roadstead, exposed to the dangerous westerly and S.W. gales, which prevail from June to October. Only small craft can enter the confined port, and find shelter during the fine season. No supplies could be obtained. Coffee is exported in considerable quantities, being brought off in lighters. Salt is made on the coast.

The LIGHTHOUSE on *Punta Izuca*, about half a mile westward of the anchorage, is a white stone tower 44 ft. high, showing a *flashing bright* light, a flash every 5 *seconds*, elevated 185 ft., and visible 20 miles.

Puerto Angel comes open when bearing about North, when some huts will be seen on the white sandy beach at its head. The lighthouse forms a good mark by day, and about 1½ mile westward of it is the conspicuous *White Rock*, 106 ft. high, less than half a mile off shore; close westward of White Rock is *Black Rock*, 40 ft. high.

Page 96.—**The Coast,** for 5 miles westward of Puerto Angel, consists of rocky bluffs 100 to 500 ft. high, followed by a sandy beach for 15 miles to *Point of Rocks*, which is low.

Escondido Bay, 14 miles westward of Point of Rocks, is bounded on the West by rocky bluffs, 50 to 100 ft. high, and at 4 miles to N.N.E. rises the *Cerro de la Ocote*, 2,161 ft. high. The bay affords good anchorage, but open to the South and West, the best being in 11 to 13 fathoms, with the rocks in the N.E. part bearing about N. by E. There is good landing at the head of the bay. Supplies of beef, poultry, and fruit could be obtained here, but no water. A good road leads hence to Oaxaca, about 70 miles inland.

At 15 miles westward of Escondido Bluffs is a sharp rocky bluff about 90 ft. high, at 1 mile East of which lies *Piedra Blanca* or *Alcatraz Rock*, 95 ft. high, and 2½ cables off shore, with two rocks eastward of it. At 4 miles West of Piedra Blanca is a low rocky bluff, at half a mile S.E. of which lies a sunken rock, with 9 ft. over it. The dangerous shoal, reported as lying 4 or 5 miles off this coast, was not found during the survey.

Chacahua Bay is bounded on the East by the *Morro Hermoso*, an isolated rounded bluff 837 ft. high, its southern face bare, and of a reddish colour. About 7 miles westward of this is *Galera Point*, or the *Little Morro*, 195 ft. high, at 6 cables East of which are some rocks 12 to 15 feet high, with deep water around them. Between the Morros lies *Chacahua Bay*, affording good anchorage, the best being in about 10 fathoms, northward of the rocks off Galera Point. On the North side of Galera Point is the shallow entrance to a large lagoon, the water of which is sulphurous; and about 10 miles inland, to N. by E., is the town of *Tututepec*, which may be seen from sea in sunny weather; fresh supplies could be obtained here.

Rio Verde, 6 miles westward of Galera Point, is fronted by breakers extending three-quarters of a mile off, and close westward of it are hills 1,200 ft. high. Hence to Maldonado Point, 49 miles to W. by N. ½ N., extends a long white sandy beach. At 5 miles from the Rio Verde are some rocky bluffs, and at 22 miles farther on are some more 50 to 75 ft. high, and of a whitish colour; here is the *Rio Tecogame*, the entrance of the *Alotengo Lagoon*, and inland the mountains gradually rise to an elevation of upwards of 8,000 feet.

Page 97.—**Rio Dulce** debouches at 14 miles N.W. of Maldonado Point, and on its North side is the village of *Tecoanapa*, where fresh beef, &c., may be obtained. Its waters are very muddy in the rainy season, and the shifting bar had about 6 ft. over it at low water. *Clio Rock* could not be found. *Acamama Point*, 8 miles westward of the Rio Verde, is low and rocky, with heavy breakers extending upwards of 1 mile S.E. from it. Within, the *Cerro del Coacoyal* rises to an elevation of 626 feet.

Hence to Rocky Point, eastward of the entrance of Acapulco Harbour, a low sandy beach extends for 60 miles, fronted by a heavy surf, off which there is anchorage in 10 to 15 fathoms. The coast is low, but rises inland to an elevation of over 6,000 feet. At 23 miles from Acamama Point is the small village of *Nexpa*, and at 20 miles West of this is the shallow mouth of the *Papagayo Lagoon*, which discharges immense volumes of muddy water during the wet season, discolouring the sea for miles off. In clear weather, *Corcovado Peak*, 4,173 ft. high, is a good mark, bearing N. by E. ¾ E. from the mouth of the lagoon.

Pages 97-100.—**ACAPULCO** now contains about 6,000 inhabitants, and its unhealthy character has been abated by the drainage and planting of the marshy tract to the East. In the dry season the temperature rarely rises above 90° F. Mail and other steamers call here regularly, and, in 1894, the Mexican Naval headquarters were transferred hither from Mazatlan. It is connected with the city of *Mexico*, 285 miles distant, by road, and works are now in progress to connect it with the railway system, but the mountainous character of the country renders this a very difficult task. At present, its commerce is insignificant, the exports consisting chiefly of lemons and other fruit, hides, and silver dollars. Cargo is landed and shipped by means of lighters, but there was no steam-tug here in 1902. Coal, of various kinds, can be obtained here, and fresh supplies and water; also sand and stone ballast, but no sea stores. Small repairs could be effected. Pilotage is compulsory, but the pilots seldom come far outside.

The fine season lasts from the end of October to the middle of May; in the rainy season there are frequent violent squalls. In summer the prevailing winds are southerly, and in winter westerly.

The harbour entrance is over 1 mile in width, widening within to more than 3 miles in extent, East and West, with depths of 20 fathoms and under, the bottom consisting of sand over clay, good holding ground. The best anchorage is in *Santa Lucia Bay*, in 10 or 11 fathoms, half a mile S. ¼ W. from Fort San Diego, mooring to a ring fixed to the outer rock off the N.W. point of the bay; at night, a small *red light* is placed on the inner rock. Another *red light* is shown on the custom-house mole.

Page 98.—*Farallon del Obispo* is 102 ft. high.

Pages 98-99.—**Roqueta** or *Grifo Island* is 350 ft. high. The *light* on its summit is shown all night, at an elevation of 379 ft., and said to be visible over 20 miles, but it is reported to be similar to a good masthead light, and not always easily distinguishable. Other observers say it appears more brilliant at a distance, than when within 5 or 6 miles of it.

Page 99.—*El Morro* is reported as appearing like a pile of yellow boulders, not more than 20 ft. above high water, when the rock eastward of it only showed 1 foot above the surface.

Pages 99-102.—The *Paps of Coyuca* are about 25 miles inland, bearing about N.N.W. from Roqueta Island. In 1898, the N.W. Pap, elevated 10,594 ft., disappeared after an earthquake; the S.E. Pap is elevated 10,574 feet. Farther inland the mountains attain an elevation of upwards of 12,000 ft., but they are frequently obscured by clouds, especially in the rainy season.

Page 101.—It is high water at Acapulco, on full and change, at 2h. 40m.; springs rise 2¼ feet. Off the bay, the current has been found setting E. by S., running from half a knot to 3 knots.

The Coast, for 3 or 4 miles N.W. of Roqueta Island, continues high, and is then followed by a low sandy beach, extending 65 miles W. by N. to the bluffs eastward of *Morro de Papanoa*; this is a bold rocky projection 527 ft. high, densely wooded.

Page 102.—**Paps of Coyuca.**—See the Addenda for page 99.

Japutica Point, 9 miles N.W. of Morro de Papanoa, is low and black, the only rocky projection on the low sandy beach extending between Morro de las Animas and Morro de Petatlan. About 1 mile eastward of it was a remarkable clear sandy patch, above the beach.

Port Sihuantanejo will be made out by *Solitaria* or *Black Rock*, 46 ft. high, lying 1 mile off the entrance. Fresh beef and water can be obtained here. *Islas Blancas*, 5 miles N.W. by W. from Black Rock, are a conspicuous group of rocks 20 to 150 ft. high, and have a white appearance when the sun shines on them.

Pages 102-103.—**Istapa Bay.**—*Istapa Islet* is 167 ft. high; *Istapa Point*, to the S.E. of it, is a wooded peninsula 216 feet high. The bay N.E. of the islet forms an excellent harbour of refuge, being sheltered from all winds but those between W.S.W. and W.N.W., which seldom blow. The rock lying half a mile N. by W. ¼ W. from Istapa Islet has 5 feet over it. Boats can reach a village about 5 miles up the *Rio Rincon*, where fresh beef can be obtained.

Page 103.—*Troncones Point*, 8 miles N.W. of Istapa Islet, is a cliffy headland 540 ft. high, rising to a peak 1,145 ft. high. Vessels can anchor off *Salada*, 1½ mile N.W. of it. Hence a low beach extends beyond the delta of Sacatula River. Boats can easily land at the village of *Canuta* in *Petacalco Bay*, but there is no safe anchorage, and the depths are liable to change.

Mangrove Bluff, in about long. 102° 11′ W., is the southern part of the delta of *Sacatula River*, the principal mouth of which debouches at Canuta. The soundings hereabout are very irregular, and in the rainy season discoloured water extends 8 to 10 miles off shore.

Between Mangrove Bluff and Lizard Point, 56 miles to W. ¾ N., the low sandy coast is only broken by a few low rocky bluffs, with mountainous country inland. At 23 miles eastward of Lizard Point is the *Bufadero*, where the sea spouts through a hole in a rock, lying about 3 miles eastward of a remarkable peak 1,443 ft. high. The soundings are irregular off this coast, but vessels can anchor in 10 to 15 fathoms, within 1 mile of the beach.

Lizard Point is a dark wooded bluff about 150 ft. high; at 6 miles eastward of it is a stream, where boats can land in fine weather. On the West side of Lizard Point is *Pichilinquillo Bay*, where vessels can anchor in 5 to 9 fathoms, sand.

Between Lizard Point and Tejupan Bluff, 25 miles to W. by N. ½ N., the coast consists mostly of steep rocky bluffs, with intervening low sandy beaches. The country inland is mountainous, reaching an elevation of about 9,000 ft. at 15 to 20 miles from the sea.

Maruata, 11 miles E.S.E. of Tejupan Bluff, is situated below a smooth wooded cone, 2,140 ft. high. It has been abandoned as a port, owing to its extremely unhealthy character. Off the white bluffs westward of it lies *Piedra Blanca*, a rock 110 ft. high.

Tejupan Bluff should not be closely approached by night, owing to the variable currents hereabout. At 2 miles N.W. of it, a dangerous reef reaches more than 1 mile off shore.

Page 104.—**Paps of Tejupan,** 20 miles E. by N. ½ N. from Tejupan Bluff, rise to an elevation of 5,660 feet. They are not easily seen from South.

Colima Volcano, 12,745 ft. high, lies about 45 miles inland, and bears about N. by W. from Tejupan Bluff.

Black Head, in lat. 18° 35′ 30″ N., long. 103° 43′ W., is 560 ft. high; the small white rock lies 2 cables off its N.W. point, and is 75 ft. high. There is anchorage in 10 fathoms, half a mile off shore, in the bay northward of it.

Marnata must be the same as *Maruata* (see above), the position given by the officers of H.M.S. *Cameleon* being apparently in error.

At 5 miles N.N.W. of Black Head is the mouth of the *Rio Pascuales*, where dyewood is occasionally loaded. At 13½ miles farther on is a pinnacle rock lying 1 mile off shore, and appearing only 5 ft. above the sea. At 10 miles beyond this is the village of *Cayutlan*, where the railway from Manzanilla turns inland towards Colima.

Punta de Campos, or *Manzanilla Point*, at the western extremity of the long low sandy beach enclosing Cayutlan Lagoon, is a bluff headland, at 2½ cables southward of which lies *Sail Rock*, 112 ft. high, with several smaller rocks around.

Between Punta de Campos and Manzanilla, over 2 miles northward, is a narrow hilly peninsula, at the North end of which is the *Vigia Grande*, 711 ft. high, with the *Vigia Chica*, 221 ft., northward of it. As seen from the West, this peninsula appears to have a cut through its central part, called *Las Ventanas*.

Pages 104-105.—**MANZANILLA BAY** is 2½ miles in width, with regular soundings, and no known off-lying dangers. The usual anchorage is eastward of the Vigia Chica, in 5 to 10 fathoms, but a more healthy berth is in 15 fathoms, farther off. The prevailing winds here are N.W. in winter, and South and S.E. in summer.

Manzanilla has much decreased in commercial importance, and in 1900 the inhabitants numbered only about 600. Works, however, are now in progress, to construct a breakwater from the Vigia Chica, to protect the anchorage, and wharves are to be built for large vessels. The adjacent swamps are also to be drained, and filled up. Steamers call here regularly, and there is a railway to *Colima*, a distance of 60 miles, which will shortly be connected with the general railway system. The exports are chiefly coffee, hides, cabinet woods, and salt, the latter made in the lagoons. Ballast can be had.

According to the U.S. survey of 1882, the middle of the town is in lat. 19° 3′ 15″ N., long. 104° 19′ 50″ W.

A *fixed red light*, elevated 18 ft., and visible 6 miles, is shown on the end of the breakwater works.

Page 105.—**Santiago Bay** is smaller than Manzanilla Bay, and more open to the South, with regular depths. Off *Punta de Santiago*, its eastern point, lies *Pelican Rock*, 72 feet high, and of a whitish colour. At half a mile off *Juluapan Point*, the western point, are *Los Frailes* or *Sisters Rocks*, from 5 to 20 ft. high. *Cerro Juluapan*, or *Table Mountain*, to N.N.W. of the point, is 2,671 ft. high; *Wreck Cone*, 3 miles S.S.W. of this, is a conical peak 1,524 ft. high.

Between Juluapan Point and Carrizal Point, 2½ miles to W. by S., are the smaller bays of *Higeras* and *Carrizal*. The latter point has a high rock off it.

Piedra Branca or *White Islet*, 2½ miles W. ¾ N. from Carrizal Point, lies 1 mile off shore; it is 260 ft. high.

Page 106.—**Colima Volcano,** 50 miles N.E. of Manzanilla, rises to an elevation of 12,745 ft., and in April, 1903, an eruption covered it with a layer of white ashes from base to summit. *Safa* or *Helado Volcano*, 3½ miles North of it, is 14,118 ft. high.

Page 107.—**NAVIDAD BAY** has regular soundings, with no known off-lying dangers. The inhabitants move inland during the rainy season. According to the U.S. survey of 1882, the village at its North end is in lat. 19° 13′ 24″ N., long. 104° 43′ 26″ W.

Cape Graham is 705 ft. high, and close off its West side lies *Cone Rock*, 280 ft. high. The outer rock, one-third of a mile to the S.W., is 8 ft. high. Hence to Navidad Head the coast consists of rocky bluffs, 50 to 100 ft. high.

Pages 107-108.—*White Rock*, off Navidad Head, is about 100 ft. high, and the sunken rock lies 4 cables S. by W. from it.

Page 108.—**TENACATITA BAY** has regular soundings, and appears to be clear of off-lying dangers, but *Centre Rock*, a pinnacle about 10 ft. high, lies half a mile E. by N. from Squall Point, in the N.W. part of the bay. At half a mile northward of Navidad Head is a conspicuous group of white rocks, and hence to the village of Tenacatita, 3 miles to N.N.E., the coast is steep and rocky. At the head of the bay is a low sandy beach. *Brothers Point* is a bluff headland 185 ft. high, and at 3 cables off it lies *Bird Islet*, 152 ft. high. *Porpoise Rock* is about 12 ft. high.

The best anchorage is off *Tenacatita*; in the dry season, there is good anchorage in 7 fathoms, in the N.W. part of the bay. Supplies of beef, &c., can be obtained from the interior. In case of need, the coquita-nut shell forms good fuel.

Page 109.—Between Brothers Point and Farallon Point, 11 miles to N.W. by W. ½ W., the coast is a low sandy beach, enclosing a lagoon. The outer *Fraile Rock*, 1 mile off shore, is 97 ft. high. *Farallon Point* has an islet close off it; there is anchorage in 10 fathoms, half a mile northward of it. Hence to Chamela, 7 miles to N.W. by N., the coast consists of low rocky bluffs.

Pages 109-110.—**CHAMELA or PERULA BAY** is a slender bight, 5 miles in extent; according to the U.S. survey of 1882, its N.W. angle is in lat. 19° 34′ 48″ N., long. 105° 8′ 54″ W. It is high water, on full and change, at 8h. 7m.; springs rise 5¼ feet. *Passarera Island* rises to an elevation of 186 ft. at its North end, and *Colorada Island* is 164 ft. high. Between them lies *Navilla Islet*, connected with the shore of the bay by a shoal of 3½ to 4 fathoms. At *Chamela* there is a conspicuous white house on a bluff; between the two southern islets off it the channel is 2 cables wide, with depths of 10 to 12 fathoms, shoaling within to 6 and 5 fathoms, 3 cables S.W. of the village.

At 10 miles inland, to the N.E. of Chamela Bay, is *Mount Gueguenton*, 3,422 ft. high, and at 5 miles farther to N. 52° E. is another mountain 4,675 ft. high; these form good landmarks, and in line lead to the bay.

Page 110.—**The Coast,** to N.W. ½ W. from Rivas Point, consists mostly of a long sandy beach, but at 15½ miles distant is *Black Rock Point*, at the foot of a peculiar black knob 655 ft. high. At 1 mile westward of this lies *Black Rock*, 35 ft. high. *Ipala Point*, 32 miles farther on, is a bold rocky bluff, at 1½ mile S.E. of which is a village; large vessels can lie in 10 fathoms, good holding ground, with a white house bearing E. ¼ S. Logwood is loaded here.

CAPE CORRIENTES, in lat. 20° 24′ N., has a flat summit 506 ft. high, and a large rock lies close off its red rocky base; at 3 cables outside this the depth is 145 fathoms. Tide-rips are occasionally seen off it.

The LIGHTHOUSE on Cape Corrientes is a white stone tower, about 60 ft. high, showing a *flashing bright* light every *minute*, elevated 270 ft., and visible 24 miles.

Page 111.—**Banderas Bay.**—It is proposed to connect this coast with the railway system. The highest *Arco Rock* is 291 ft. high. *Punta Mita* has a dangerous breaking rock lying 1 mile S. by W. ¼ W. from it; the prominent hill, 1½ mile inland, is 454 ft. high. The N.E. islet of *Las Tres Marietas* is 179 ft. high, and the centre islet 132 feet.

Pages 112-113.—**The TRES MARIAS.**—*Cleopha* lies 56 miles S.W. by W. ¾ W. from San Blas. *Magdalena* rises to an elevation of 1,500 feet. *Maria Madre* is 2,020 ft. high. *San Juanito* is 150 ft. high.

Page 114.—**Piedra Blanca del Mar.**—In 1901, the steamer *Arequipa* passed through a heavy tide-rip, about 7½ miles S.W. by W. ½ W. from this rock, and sounded in 18 fathoms, sand. It is possible there may be a shoal hereabout. *Piedra Blanca de Tierra* lies S.W. (not S.E.) of the entrance to San Blas.

Pages 114-119.—**SAN BLAS** now contains only about 2,000 inhabitants, and has still further declined in commercial importance since the extension of the Mexican

railway system to Guadalajara. It is the port of the town of *Tepic*, about 35 miles inland, towards which 10 miles of railway has been constructed, but the work has been abandoned. Mail and other steamers call here regularly, but from September to November the stormy weather often renders landing impossible. The exports consist of silver-ore, hides, tobacco, and rubber. Cargo is landed and shipped by means of lighters. Ballast can be had.

In 1898, the officers of H.M.S. *Amphion* reported that the harbour was silting up. The bar was almost dry at low water, and had only 6 or 7 ft. over it at high water

The land southward of San Blas is mountainous. *San Juan* is 7,550 ft. high, and to the S.S.W. of this are the conspicuous peaks of *Compostella* and *Vallejo*, 4,262 ft. and 5,036 ft. high respectively.

Page 119.—*Cordonazo de San Francisco.*—See Addenda for pages 83-84.

Page 120.—**Rio Grande de Santiago,** or *Lerma*, is one of the principal rivers of Mexico, but is useless for navigation. Dangerous shoals extend 2 miles off its mouth.

Cabeza de Caballo rises to an elevation of 1,979 feet.

Pages 121-126.—**MAZATLAN** now contains about 16,000 inhabitants, and is of considerable commercial importance, which should be enhanced by the approaching completion of the railway from Durango, connecting it with the Mexican system. It is also proposed to construct a line along the coast to Altata and Guaymas. It has several cotton-mills, and in the vicinity are sugar-mills and distilleries. At present, the exports consist mainly of silver and gold from the rich mines of the Sierra Madre, with small quantities of hides, fibre, dyewood, etc.; in 1899, they were valued at £635,087, of which silver represented £486,568, and gold £130,934. Mail and other steamers call here regularly. Fresh meat and vegetables are usually fairly plentiful, but other supplies are scarce. Good fresh water is laid on in pipes to the pier. Coal is sometimes stored here in small quantities, and is towed off in lighters by a tug; in 1900, none was to be had by H.M.S. *Pheasant*. Ordinary repairs can be executed to vessels and their machinery.

In the dry season, from November to May, the climate is healthy, but during the remainder of the year it is very hot and unhealthy, with constant storms and rain.

The anchorage is an open roadstead, exposed to southerly winds between S.E. and West, and therefore affords no shelter from the South and S.W. gales of the rainy season, the approach of which is usually announced by signals from the observatory. The bottom being hard sand, the anchors are liable to drag in bad weather. Cargo is landed and shipped by means of lighters. Pilotage is compulsory, but the pilots do not come far out, and need supervision.

Capt. Höckelmann, of the barque *Antigone*, 1896, states that during the stormy season he found the best anchorage about 2½ cables N.N.W. of Black Rock, head to sea, and the vessel lay much more quietly than others farther in.—*(Annalen der Hydrographie*, 1897, page 10).

During neap tides the current sets weakly to the S.E., but at new and full moon it may run 2 or 2½ knots to the N.W.

In 1891, Capt. J. von Helms, steamer *Newbern*, found good anchorage in 6 fathoms during a S.E. gale, off the North side of *Pajaros Island*, with the S.E. point of Pajaros and the N.W. point of Venado just open. Breakers were seen about 1 mile off the N.W. point of Pajaros.

Only small craft can lie inside the bar, which has 12 ft. over it at high tide. It has been proposed to dredge the bar and harbour, so as to admit large vessels. Occasionally the sea breaks right across, eastward of Pala Point.

It is high water, on full and change, at 8h. 45m.; springs rise 6 ft., neaps 3½ feet.

Page 121.—*Venado Island* is 587 ft. high, and *Pajaros* 467 feet.

Lights.—The light on *Creston Island* is elevated 515 ft., and at a distance has the appearance of a star. It is intended to alter it to a *group-flashing* light, and to greatly increase its power. An electric light was shown on the pier at Mazatlan.

Hermanos Rocks are both 152 ft. high; *Tortuga Rock* lies W. by N. from the southern rock.

Page 122.—*Blossom Rock* has only about 7 ft. over it, and the *red buoy* on its West side is very liable to drift or disappear.

Pala Point has a fort near its southern extreme, at 200 yards N.W. by N. ¾ N. from which is the *Signal Station*, at the observatory, elevated 294 ft., in lat. 23° 11′ 17″ N., long. 106° 26′ 39″ W. The rock to eastward is marked by a beacon and buoy, and the inner rocks have a beacon on them.

Nearly 1 mile to N.N.W. of Pala Point is *Peresil Point*, at half a mile West of which the sea is said to break with a moderate sea.

Page 126.—*Port Dues*, etc., are liable to alterations.

Pages 128-129.—**LOWER CALIFORNIA**, one of the Mexican States, has an area of over 58,000 square miles, of which less than one-tenth is thought to be available for cultivation, etc. At the census in 1900 the population numbered 47,624, mostly of Spanish descent, the aborigines having been all but exterminated by disease. It has valuable deposits of minerals, such as gold, silver, copper, lead, etc., while the surrounding seas abound with fish, but commercial enterprise is much impeded by the great difficulties of land communication in this mountainous country. The capital is La Paz.

The peninsula is still unexplored, for the most part, but our knowledge of it has been increased by American and other explorers. It may be considered as divided physically into three regions, of which the southern extends for about 100 miles, or from Cape San Lucas to beyond La Paz, and consists of irregular granite mountain chains, attaining a maximum elevation of about 8,000 ft. at the peak of *Santa Genoveva*, in lat. 23° 22′ N. This is followed by a central desert region, about 450 miles in extent, with table-lands and flat-topped mountains of volcanic origin, rarely rising to elevations over 3,000 to 4,000 ft., and almost destitute of water. The northern region, about 200 miles in extent, is a range of granite mountains, culminating in *Calamahue Peak*, 10,126 ft. high, in lat. 31° N., being a continuation of the mountainous region of southern California; the valleys here are well watered.

Snow is not seen on the high peaks in the southern and central regions. Volcanic activity is now all but extinct, but earthquakes are still occasionally experienced at Loreto, and sulphurous vapours are sometimes given off by the central peak of the Tres Virgenes, in about lat. 27½° N.

The western or Pacific coast of the peninsula is nearly all low and sandy, broken in places by shallow lagoons, with no sheltered harbour along it. The eastern or Gulf coast is more elevated, with numerous sheltered bays and harbours.

The southern or *Cape Region*, between Cape San Lucas and La Paz, is very healthy, and, owing to the regular rainfall, vegetation is very luxuriant near the coast. At San José the annual rainfall may amount to 12 or 15 inches, mostly falling (and often torrentially) in the summer, or from July to November, when S.E. winds prevail; in some years, rain, known as *equipatas*, is also experienced from the North in January. September is the wettest month. Hence the rainfall gradually decreases to La Paz, where there may be little or no rain for two or three years in succession.

The rainfall, however, varies widely from year to year, and rain rarely falls from December to May inclusive. On the Gulf coast of the peninsula, most rain falls during the summer, and on the Pacific coast during winter, or between December and March. The region northward of La Paz is very dry, and thence the rainfall gradually increases northward. Sometimes the Pacific coast may get no rain for three or four years in succession; here San Quentin may be considered as the northern limit of the summer tropical rains, and the southern limit of the winter rains from the North.

Winds, etc.—We may here give a *resumé* of the information on this subject, by M. Léon Diguet, appearing in the "Nouvelles Archives des Missions Scientifiques, etc.," tome ix., 1899, pages 10-25.

On the peninsula of Lower California, the prevalent winds blow as *monsoons*, from the N.W. during the winter or dry season, and from the S.E. during the summer or wet season, being caused respectively by the influence of the vast desert plateaux of Arizona on the North, and the tropical regions on the South.

The N.W. monsoon usually prevails from December to the end of March, or even later, and is a cool dry wind, often blowing strongly for fifteen days in succession. It causes the barometer to rise, and has an irritating effect on the human constitution. It usually ceases by night.

The S.E. monsoon does not blow so strongly or regularly, and causes the barometer to fall, while its effects are healthy and pleasant. This, however, is the season of the dreaded *cordonazo*.

The period between the N.W. and S.E. monsoons is usually calm, and the waters of the Gulf are then often scarcely rippled, and multitudes of microscopic diatoms may appear on the surface, giving rise to its appellation of the *Red* or *Vermilion Sea*.

The land-breeze, or *terral*, blows regularly from the West along the Gulf coast (but not on the Pacific coast), and its influence is sometimes felt for 25 miles off shore. It blows most strongly in winter, when it sets in soon after sunset, and may last for some hours after sunrise. In summer its effects are much less, it then often blowing only for a few hours before sunrise.

The sea-breeze is rarely felt on the Gulf coast; though prevalent on the Pacific coast, especially in winter.

Fogs are rarely experienced on the Gulf coast, and only during the winter, when

they may also be met with on the Pacific coast. Dense fogs, however, may be experienced occasionally in the Gulf, at the time of the equinoxes, over a small area, but some years they are altogether absent.

Page 130.—**GULF of CALIFORNIA.—Winds, etc.**—The following information, derived from that recently published by the U.S. Hydrographic Office, may be read in connection with the above remarks.

The wet season lasts from July to November, the wettest months being August and September. At Mazatlan, and along the Mexican coast generally, the day then sets in with a light S.E. breeze, ceasing between 7 and 8 a.m., and followed by a calm lasting till 11 a.m. The sea-breeze then sets in from S.W. to S.S.W., freshening as it gets to the West. As a rule, the wind shifts between 9 and 11 p.m. to South and S.E., lasting about 2 hours, and accompanied by heavy rain, thunderstorms, and squalls.

From October to March, the wind blows steadily from the N.W., increasing in strength with a rising barometer. If the latter rise to 30·16, a gale or *norther* may be expected, blowing for 3 to 15 days in succession, and presaged by clouds on the mountain peaks.

From May to August, both inclusive, the winds are variable, S.E. winds prevailing along the western side of the Gulf, and S.W. along the Mexican side, though northerly and N.W. winds are not infrequent.

Page 131.—*El Cordonazo.*—See the Addenda for pages 83-84.

From regular observations, extending over several years, it is found that the mean barometer, reduced to sea-level and to 32° F., at Mazatlan varies between 29·88 in September and 30·02 in January and February; and at Santa Rosalia, between 29·74 in June and 29·98 in January. The diurnal range over the Gulf is very decided, under normal conditions, the barometer at 10 a.m. standing usually ·10 higher than at 4 p.m.

The *Tides* and *Currents* are irregular throughout the Gulf; during strong northers, high water generally occurs between 6 and 10 a.m.

The currents vary with the winds, usually setting S.E. in the middle of the Gulf, and along the Mexican side, and sometimes attaining a velocity of 5 knots.

If bound from Cape San Lucas to Guaymas, vessels are recommended to keep over on the western side, where the contrary current is not so strong, and a good land-breeze may be found off the coast in the early morning.

Piastla Point.—The reef is reported to extend 1½ mile off. The best anchorage northward of it is with Piastla Point bearing S. ¼ E., and San Miguel Point N.W.

Page 132.—**Off-lying Bank.**—In April, 1899, Capt. J. von Helms, of the steamer *Orizaba*, reported that, when 16 miles S.W. ¾ W. from the town of Altata, he sounded in 13 fathoms, and steering about 9 miles to the E.S.E. he found depths of 8, 7, and 6½ fathoms, and at last 5½ fathoms, when Altata bore N.N.E., distant 13 miles.

CULIACAN RIVER entrance is subject to constant changes, and was completely altered by the hurricane of October 1st, 1895. The channel now passes over what was formerly the South end of *Baredito Island*, and a new opening was formed through the *Lucenilla Peninsula*, at *Tunina*, about 10 miles S.E. of Altata, with 3 fathoms in it at low water. The channel to Altata was marked by buoys, but in 1902 they were stated to have all disappeared; the bar had 12 to 13 ft. over it at high water.

Pages 133-134.—**ALTATA** contains about 5,000 inhabitants, but is of small commercial importance, the import trade being limited. The mail steamers call regularly. The chief exports are silver and dyewood. Supplies of beef, pigs, fowls, and oysters may be obtained. Small repairs can be effected at the railway works at Culiacan.

The climate of Altata is hot and dry, though cold northerly winds sometimes occur in winter. The fine season lasts from the end of October to the end of May; *chubascos*, and violent gales from West and S.W., are occasionally experienced during the rest of the year. The chubasco blows between South and S.E., and the inhabitants say a severe one usually occurs about St. Augustine's day, October 4th.

Vessels bound to Altata from the South are recommended to make the coast well to the South, as it is low and not easy to recognise. When in 10 or 12 fathoms, off the Culiacan, the railway station may be seen, but no other buildings. If farther off, the pilot may not come off in answer to signals. In thick weather, vessels must beware of passing the port, many having mistaken the Boca Tule for the Culiacan. Sailing vessels are towed in and out, if required, by a coasting steamer.

In 1905, the new channel leading to the harbour was marked by *buoys*, the outer one being *conical*, painted in *black* and *white stripes*. No marks can be given for them.

Page 134.—**The Coast**, between Altata and Playa Colorada, is formed by the low narrow sandy islands named *Baredito*, *Altamura*, and *Saliaca*, on which are a few

bushes. At night, it should not be approached within a depth of 13 to 15 fathoms. *Perihuete Peninsula*, on the N.W. side of the Playa Colorada Estero, is more elevated, and forms a good landmark.

Playa Colorada is about 10 miles inland, and can be reached by vessels drawing 6 or 7 feet. Strangers bound here are recommended to ship some one at Altata, or elsewhere, who knows the locality, as a boat must be sent in on the vessel's arrival at the roadstead. Cargo, chiefly dyewood and ore, is brought off in lighters. Onions, beans, and peas can be obtained here, but other supplies are scarce.

Capt. Tooren, of the ship *Dona Evelina*, 1890, recommends vessels loading here to anchor with Perihuete Peninsula bearing N.E., during the season of N.W. winds; at other times, when S.E. winds prevail, they should lie farther to the S.E. In June the *Dona Evelina* lay in 5 to 6 fathoms, with the peninsula bearing N. by E.

Page 135.—**Topolobampo Harbour.**—The entrance and channel are marked by *buoys*, the outer or fairway buoy, painted in *black* and *white stripes*, lying in 6 fathoms, in the middle of the channel. In 1904, Capt. W. E. Hutton, of the schooner *F. S. Redfield*, found 17 ft. in the channel over the bar, at dead low water, but the tidal currents run strongly, and the pilots do not like to take vessels drawing over 16 ft., at high water. The schooner anchored in 8 fathoms, about 2 cables N.W. of the outer buoy.

Page 135.—**Rio del Fuerte,** one of the principal Mexican rivers, has a course of 275 miles, and never runs dry.

Page 136.—**Santa Barbara Bay.**—A customs station has been established here. Fresh water can be obtained.

Between Lobos Point and Guaymas, the currents are usually strong and variable, and fogs are frequent.

Page 137.—**CAPE HARO** is a bold rocky headland, and on its western part is a hill 365 ft. high. The lighthouse is connected with Guaymas by telephone, and vessels approaching can thus signal for a pilot to come off. There is a wireless telegraph station here in connection with one at Santa Rosalia, across the Gulf of California.

The LIGHTHOUSE on Cape Haro is an iron frame tower 24 ft. high, showing a *fixed bright* light, varied by a *flash* every *minute*, elevated 346 ft., and visible 24 miles. It is in lat. 27° 50′ 41″ N., long. 110° 54′ 30″ W.

Pages 137-140.—**GUAYMAS** contained about 4,000 inhabitants in 1900, and has a poor appearance. Its trade consists chiefly in the export of silver-ore, with small quantities of hides, gold, guano, and cabinet woods. Steamers can obtain supplies of coal here, but the price is high. The climate is hot, but not unhealthy. Supplies of fresh meat, fish, and water may be obtained but coal is not always to be had. At 4 cables westward of Baja Point is a patent slip, with a cradle 200 ft. long, for vessels up to 1,500 tons; small repairs can be executed for vessels and their machinery. There is a government coal store adjacent. At the S.W. end of Ardilla Island is a warehouse, off which a wharf extends into 17 ft. at low water.

The harbour is spacious and landlocked, but the greater part is shallow, so that within Baja Point the outer harbour is not suitable for vessels drawing over 22 feet. In February, 1904, soundings obtained by H.M.S. *Shearwater* showed 2 to 3 ft. less water, between Ardilla and San Vicente Islands, than the depths given on the chart. The best anchorage is in $3\frac{1}{2}$ to 4 fathoms, mud, between Almagre Island and Morro Ingles. Cargo is landed and shipped by lighters.

Page 141.—**TIBURON ISLAND**, and the adjacent mainland, known as *Seriland*, is an arid region, occupied by a fierce people, of whom little is known. The shores abound with fish and turtle.

Page 143.—**George Island.**—At 7 miles to S.E. by S. is a $4\frac{3}{4}$-fathoms shoal, 5 miles off shore. At 4 miles N.E. of the island, a dangerous shoal extends 3 miles off the coast.

Page 144.—**Port Isabel** has been abandoned.

Page 147.—**Ometepes Bay**, about 10 miles southward of Sargents Point, is reported to be about 3 miles in diameter, landlocked and clear of danger, with a depth of 5 fathoms. The entrance is 100 yards wide, with 3 fathoms at half-tide. Turtle, fish, and game abound.

Mount Calamahue is reported to be only 9,130 ft. high.

Page 148.—**Willard Bay**, on the N.W. side of San Luis Gonzales Bay, is said to have depths of 5 to 10 fathoms, and to be clear of danger. It extends 5 miles to the N.W., and affords sheltered anchorage; turtle, fish, and game were abundant, and inferior fresh water was found on its northern side.

Page 153.—**SANTA ROSALIA** is a town of 3,000 or 4,000 inhabitants, in about lat. 27° 20′ N., long. 112° 16½′ W., founded in 1885 at the Cañon de Providencia, or 3 miles southward of the former Cañon de Santa Rosalia. It is entirely a mining and smelting settlement of the Boleo Copper Company, the tall chimnies and furnace fires of which are conspicuous from sea. Vessels bring coal, coke, and fuel, and load copper and matte, about 1,000 tons being shipped monthly. Cargo is landed and shipped by means of lighters, towed by steam-launches, the wharf having been washed away. Fresh supplies, water, and stone ballast can be obtained, but rather dear, and coal in small quantities. There is regular steamer communication with Guaymas, &c., and there is a wireless telegraph station here, in connection with one at Cape Haro, near Guaymas. A hospital is maintained.

Vessels bound here should first make Tortuga Island, and then steer in for the coast. The pilot and signal station is South of the town; the pilots will come 4 or 5 miles off, when a vessel is seen approaching, but they do not come off at night or in bad weather. Pilotage is compulsory, and costs 1¾ dollar per foot of draught.

The roadstead is open and exposed, and several vessels have been lost here. Harbour works are now in progress, the North mole being sufficiently advanced to shelter vessels from N.W. winds. The depth increases rapidly seaward, so that vessels lie close to the shore; 10 to 15 fathoms is found 2½ cables off, deepening to 40 and 70 fathoms at 1 mile off. In November, December, and January, the surf sometimes prevents boats landing. The tidal currents are irregular.

In 1905, Capt. Hall, of the yacht *Rover*, stated that the breakwater affords little protection during strong northerly winds; with southerly winds, only small vessels can shelter behind the southern wall. Water was supplied at 5 cents a gallon.

Between Santa Rosalia and Mulege there are considerable areas of land along the coast suitable for cultivation by means of irrigation.

Page 154.—**San Lucas Cove,** or **Port Paraiso,** is about 3 miles in extent, and has depths of 3 to 5 fathoms within the shallow bar. Hence the coast trends 14½ miles E. by S. to Chivato Point.

Page 155.—**MULEGE** is decreasing in importance, the population only numbering about 400 in 1900. The anchorage is unsafe with N.W. gales; in approaching, do not bring Colorado Peak to bear West of W. ½ S. Fish and game are abundant hereabout.

Page 157.—**CONCEPCION BAY** is exposed to N.W. gales, but vessels may then lie sheltered under one of the islets in *Coyote Bay*. In 1900, there were three small cattle ranches here.

Pages 159-160.—**LORETO** is now only a small village, and the fine old church has been ruined by earthquakes and floods. The date palm flourishes in this locality. The anchorage is open to winds from North, N.E., and S.E.

Page 162.—**Salinas Bay.**—A substantial wooden pier has been erected here, alongside which vessels drawing 20 ft. can lie and ship the salt, which is sent to San Francisco in large quantities. The bottom is sand over mud, good holding ground. Fresh water can be had at the wharf.

Page 163.—**Santa Catalina Island** has some deposits of silver-ore.

Page 165.—**SAN JOSEF ISLAND** has some deposits of silver-ore in its western part.

Pages 168-169.—**LA PAZ** is a clean well-built town, situated amid beautiful gardens. It has about 6,000 inhabitants, chiefly of Spanish descent, and there is regular communication by steamer with Guaymas, etc. Its chief export is silver bullion, with small quantities of hides, fine pearls, bark, etc. Excellent fresh water may be had here, and good stone and sand ballast is plentiful. A hospital is maintained. A small *red light* is shown on the wharf. In 1905, Capt. Hall, yacht *Rover*, stated that pilots will come off during daylight. Fresh water can be had in limited quantities from wells on the beach, at 1½ cent per gallon.

Vessels drawing up to 13 ft. can reach the town at any time of tide, and the anchorage is good and well sheltered. In 1898, the channel was marked by a buoy on each side of the entrance, within which the starboard side was marked by eight *conical red* buoys. It is high water, on full and change, at about 10h.

Light.—A red iron turret stands near the beach, N.E. of the wharf, and 70 yards westward of the customhouse; it exhibits an *occulting bright* light, *fixed* for 5 seconds, and then *eclipsed twice* in 1½ second, elevated 26 ft., and visible 11 miles.

Page 169.—**Pichilinque.**—The coal stored on San Juan Island belongs to the Mexican government, and is mainly for the use of their vessels. The island is now

occupied by a company working the salt lagoon. A white framework *beacon*, 20 ft. high, stands on the South end of the island.

Pages 170-171.—**San Lorenzo Channel.**—In June, 1904, *Scout Shoal* was marked by a *black can buoy* on its northern side; *San Lorenzo Reef* by a *red spar* on its eastern side; and *Suwanee Rocks* by a *red nun buoy* on their northern side. These buoys cannot be depended on, as they often get adrift.

Page 172.—**La Ventana** is now in ruins, and no supplies can be had.

Page 174.—**Gorda Banks.**—During the survey by the officers of the U.S.S. *Thetis*, in 1897, a depth of 17 fathoms, rocky and coral bottom, was found at 4½ miles S.E. by E. from Gorda Point. Another sounding of 34 fathoms was found 2¾ miles farther to E. by S. ⅛ S., the depth between and around these banks being 100 fathoms and over.

Page 175.—**SAN JOSE del CABO** now contains about 2,000 inhabitants, chiefly engaged in fruit and cattle farming, along the fertile valley of the San José River. This river has a course of 40 or 50 miles, and is the largest stream in the Lower Californian peninsula; by means of irrigation, all the products of the Tropics can be raised. The custom-house has been removed hither from San Lucas. Steamers call here regularly.

Page 177.—**CAPE SAN LUCAS Lighthouse,** established in January, 1905, is a red octagonal tower, 52 ft. high, standing on *Cabo Falso*, in about lat. 22° 52¼′ N., long. 109° 57¾′ W., showing a *flashing bright* light every 5 *seconds*, elevated 262 ft., and visible 22 miles.

Page 178.—**San Lucas.**—As stated above, the custom-house has been removed to San José, and the village now only contains about 60 inhabitants.

Page 178.—**The West Coast** of Lower California is very desolate, there being only a few small settlements, as at Magdalena, San Quentin, and Todos Santos Bays.

Winds, etc.—See the Addenda for pages 128-129.

Page 180.—**Petrel Bank.**—On April 8th, 1904, the officers of the U.S.S. *Petrel* noticed an uneasy swell, and change in the colour of the water, about 35 miles westward of Magdalena Bay entrance. On sounding, a least depth of 10 fathoms, fine grey sand, was found in about lat. 24° 37′ 5″ N., long. 112° 45′ 45″ W. At 9¼ miles N. 52° W. from this a depth of 60 fathoms was found, with varying depths of 12 to 24 fathoms between, and then deep water. The extent of the bank to the S.E. is not known.

Page 182.—**MAGDALENA BAY.**—In September, 1904, the officers of the U.S.S. *Paul Jones* saw two submerged rocks lying nearly 4½ miles S.E. by E. ¾ E. from *Cape Redondo*, with White Bluff peak bearing N.E. ¾ E., distant 7½ cables.

The small pinnacle rock off *Entrada Point* is very conspicuous, and may serve as a landmark in coming from the West, should Santa Margarita Island be obscured by mist. The settlement has about 40 inhabitants, and is known as *Port Magdalena*; it has much decayed since the decline of the orchilla trade. Steamers call here regularly.

Light.—In *Man-of-War Cove* stands a red iron turret, 23 ft. high, showing an *occulting bright* light, *fixed* for 5 seconds, and then *eclipsed twice* in 2½ seconds, elevated 27 ft., and visible 10 miles. The previous light is discontinued.

Page 183.—*Mount Isabel* is 1,250 ft. high.

Page 185.—**Cape San Lazaro.**—In 1897, Capt. J. von Helms, of the steamer *Orizaba*, saw a line of heavy breakers extending 2 miles northward from the cape, the outer breaker being detached, and half a mile farther out. They appeared as if caused by rocks, but may possibly have been heavy tide-rips. A strong inshore set has been met with hereabout.

Thetis Bank, of 19 fathoms, rock, sand, shells, and coral, was found during the survey by the U.S.S. *Thetis*, in 1895, at 19½ miles W. by N. ½ N. from San Lazaro Peak.

ALIJOS ROCKS.—According to the most recent observations, the South rock is in lat. 24° 58′ N., long. 115° 52′ W.

Page 186.—**San Juanico Point.**—In 1893, the U.S.S. *Thetis* touched on a dangerous detached shoal, about three-quarters of a mile S.E. ½ S. from the point; the sea seldom breaks on it.

During recent surveys by the U.S.S. *Thetis* and *Alert*, several banks were found, with deep water over them, between the parallels of Cape San Lazaro and Ballenas Bay. They lie far off the coast, and will best be understood by referring to the chart.

Pages 187-188.—**San Ignacio Lagoon** appears to be diminishing in size, owing to the gradual rising of its shores. Near its head is the village of *El Ranchito*, with about 100 inhabitants, where supplies of fruit, vegetables, and water may be obtained.

Pages 188-189.—**Point Abreojos.**—*Knepper Shoal*, of 2¼ fathoms, lies 2½ miles to N.E. by E. ¾ E., and nearly 1 mile off shore. *Wright Shoals*, of 2 to 3 fathoms, lie 1¾ mile off the point, between S.E. ½ E. and S. by E.

Page 189.—*Whale Rock* rises 10 ft. above high water.

In 1892, Capt. J. von Helms, of the steamer *Newbern*, reported that he twice passed through extensive patches of petroleum and floating asphalte, when about 18 miles S.W. ½ S. from *San Hipolito Point*.

Page 191.—**SAN BARTOLOME BAY.**—In 1897, the officers of H.M.S. *Pheasant* reported that *Coffin Rock* is about 60 ft. high, and the rock nearest Cape Tortolo 40 ft.; *Sulphur Rock* is very conspicuous, being of a light colour with two projecting black horns. No inhabitants were seen.

Page 192.—**Natividad Island.**—*Lowry Rock*, 1 mile East of Flat Rock, has only 6 or 7 ft. water over it.

Page 193.—**CERROS ISLAND.**—At three-quarters of a mile southward of the N.E. point is a settlement, conspicuous from sea.

Page 195.—**San Sebastian Viscaino Bay.**—In October, 1905, Captain Hall, yacht *Rover*, reported that at 10 *p.m.*, shortly after leaving Scammon Lagoon for Lagoon Head anchorage, he passed about 1 mile to leeward of what appeared to be a shoal spot, breaking heavily with a moderate north-westerly breeze, in about lat. 28° 3′ N., long. 114° 18′ W.

Page 197.—**San Antonio Point.**—In 1898, the U.S.S. *Monadnock* sounded in 39 fathoms, about 15 miles S.W. by S. ½ S. from this point.

Sacramento Reef is about 2 miles in extent, E.S.E. and W.N.W.

Pages 198-199.—**Port San Quentin.**—The channel to San Quentin is marked by buoys, maintained by a land company.

Page 200.—**Ben Rock.**—In 1903, the captain of the mail steamer *Acapulco* reported that he passed near a discoloured patch of water, looking like a shoal, about 6½ miles S. by E. ⅜ E. from Ben Rock.

Page 201.—**TODOS SANTOS BAY.**—On the N.E. side of the bay is the rising town of *Ensenada*, containing about 800 inhabitants, the centre of an agricultural and mining colony, copper and gold being found in the vicinity. The climate is pleasant and healthy. It is connected with the telegraph system, and it is proposed to construct a railway to San Diego, with which there is frequent communication by steamer. A wharf has been constructed, and vessels drawing up to 19 ft. can lie afloat alongside at low water. Fresh provisions and water can be obtained here.

Pages 204-206.—**CALIFORNIA** has an area of 158,360 square miles, and the census returns of 1900 gave the population as 1,485,053. Of recent years, its productions have been increased by the working of the petroleum deposits, chiefly in its southern part, and it is now only second to Spain as a source of mercury. In 1904, the gold produced was valued at £3,800,000, a large increase on recent years.

Owing to the influence of the cool northerly current, all this coast is much subject to fog, in summer, especially at night. From Point Concepcion this current continues southward, passing outside the off-lying islands, within which a warm northerly counter-current sets up the coast. These currents meet off San Diego.

Series of soundings taken by officers of the U.S. Navy show that fronting the coasts of Lower California and California are several remarkable depressions, or submarine valleys, in some cases reaching within a short distance of the coast. In foggy weather, the existence of these must be borne in mind, as a vessel running along the axis of one might be misled by the deep soundings. One of the most remarkable is that running through the centre of Monterey Bay, the depth of 50 fathoms being found within less than half a mile off Salinas Landing, and 868 fathoms at 16½ miles off shore. Further information must be gained from the chart.

Uniform System of Buoyage.—On the coasts of the United States the buoys are arranged as follows :—

In approaching ports and channels from sea, those on the *starboard* side are painted *red*, and those on the port side *black*. Those marking middle grounds and obstructions, which may be passed on either side, are painted in *red* and *black bands*. Buoys painted in *black* and *white stripes* mark mid-channel, and must be passed close to. Prominent buoys may carry topmarks.

Three forms of buoys are in use, the *nun* (or truncated *cone*), *can*, and *spar*, and they are made in three sizes. Main channels are marked by nun buoys, secondary channels by can buoys, and minor channels by spar buoys. Where there is but one channel of

approach, nun buoys usually mark the starboard side of the channel, and can buoys the port side.

Storm Signals are exhibited at the ports and harbours, &c., of the United States, as follows:—A square *red* flag with *black* centre indicates an approaching storm. A *red* pennant indicates easterly winds, between N.E. and South; and a *white* pennant, westerly winds, between S.W. and North. If the pennant be hoisted above or below the square flag, it signifies winds from the N.E. and N.W. quadrants, and the S.E. and S.W. quadrants, respectively. When a *Hurricane* is expected, two storm flags are hoisted vertically. The *red* pennant alone indicates information may be obtained from the officials. At *night*, a *red* light indicates easterly winds; and a *bright* light above a *red* light, westerly winds.

Telegraphic Signal Stations, by which messages can be forwarded to or from vessels, are established at Point Reyes lighthouse, North Head (Columbia River), and Neeah Bay. Government *wireless* telegraph stations have also been established at Panama, Farallon Islands (off San Francisco), Yerba Buena Island, and Mare Island Navy Yard, and others are to be established. Merchant vessels, fitted with suitable apparatus, can avail themselves of their services.

Standard Time, along the Pacific coast of the United States, &c., is 8 hours later than Greenwich.

Life-Saving Signals.—A *red* flare or rocket, indicates assistance is preparing. A *red* flag, light, rocket, or Roman candle, signifies "haul away." A *white* flag, light, rocket, or Roman candle, "slack away." A *white* flag and a *red* flag, or lights, or a blue light, "impossible to land in ship's boats." A man beckoning, or two torches, indicate the best place to land.

Rule of the Road for Inland Waters.—Within certain limits at San Diego, San Francisco, and Columbia River (as defined hereafter in the Addenda), the International Rule of the Road is subject to the following additions or alterations:—

Art. 2.—A steamer over 150 ft. long must carry amidships a globular white lantern light 15 ft. higher than and over 75 ft. abaft of the foremast light.

Art. 3 & 5.—A steamer towing, and a vessel towed, must also carry a small white light abaft the funnel or after-mast, but not visible forward of the beam.

A steamer towing a raft, instead of the vertical lights, is to carry at the fore, at an elevation between 20 and 40 ft. above the hull, two globular white lights not less than 8 ft. apart horizontally athwartships; and the light aft (Art. 3).

Art. 15.—*In Fogs*, a steamer under way to sound three blasts of her whistle, or if towing a raft, a blast of 3 to 5 seconds, at intervals of not more than 1 minute. A vessel towed to sound two double blows on her bell in quick succession every minute.

A steamer going with the current, in a narrow channel, has the right of way.

Page 208.—**POINT LOMA Lighthouse.**—See the Addenda for page 210. There is a modern battery on the point.

Pages 208-210.—**SAN DIEGO BAY** forms a landlocked harbour, with an area of 22 square miles, of which 6 square miles is suitable for anchorage for large vessels. By the partial construction of a breakwater, confining the action of the ebb tide, the outer bar has now a depth of 22½ ft. over it at low water, and a channel has been dredged over it to a depth of 30 feet. The inner channel has also been improved by dredging, and vessels of the largest size can now safely enter, and lie afloat alongside the spacious wharves at the city. Those drawing up to 24½ ft. can reach *National City*, 3 miles southward of San Diego, at high water. Pilotage is compulsory.

On the western part of the beach enclosing the bay is the popular pleasure resort of *Coronado Beach*, where there is a large hotel, on the tower of which, at 120 ft. above the sea, a conspicuous electric light is usually shown at night.

Vessels are now advised not to pass through the kelp near Point Loma, but to pass eastward of the outer buoys. *New Hope Rock*, with 17 ft. over it, lies 1¾ mile N.W. by W. from the lighthouse. A dangerous rock was reported nearly half a mile S.W. by S. from the lighthouse, but could not be found when searched for. However, in 1894, a 26-ft. patch was found at 5½ cables S.W. ¼ S. from the lighthouse; and in July, 1902, the ship *Aberfoyle*, drawing 21 ft., struck heavily when about half a mile S.S.W. from the lighthouse, and a sounding of 5¼ fathoms was taken.

The Breakwater extends over *Zuninga Shoal*, on the eastern side of the entrance, in a general S. by E. direction, for 2,500 yards, completed in 1904. A small *red light* is shown on the extremity, and a *bright light* on the low spur extending 100 yards off its western side. The shoal is constantly changing.

A datum mark has been erected on *Gammon Shoal*, on the prolongation of the axis of the breakwater, and 11 cables E. ⅞ S. from Point Loma lighthouse.

Buoys.—In 1905, the *Outside Bar Whistle buoy, nun*, painted *black* and *white stripes*, was placed off the eastern side of the southern end of the kelp extending off Point Loma; with the lighthouse bearing N. by W. ½ W., distant 2½ miles, and the Coronado hotel tower N.E. by N. ⅜ N.

Outside Bar Bell buoy, nun, black, lies in 9 fathoms, nearly 9 cables S.E. ⅛ E. from the lighthouse.

San Diego Bar (outside) buoy, No. 1, a *black can*, lies on the bar, at 7½ cables East from the lighthouse, and must be left to port in entering.

Gammon Shoal buoy, No. 2, *nun, red*, lies on the West end of the shoal, at 8½ cables E. ⅞ S. from the lighthouse, and must be left to starboard in entering.

The main dredged channel into the bay passes between the two latter buoys, in a N. ¼ E. direction.

San Diego Bar (inside) buoy, nun, red, lies in 6 fathoms, off the western edge of Zuninga Shoal, at 8½ cables E.N.E. of the lighthouse.

Rule of the Road for Inland Waters.—(See the Addenda for pages 204-206). These rules are in force in the port of San Diego, within the limits of a line drawn from Point Loma to the outside bar whistle buoy, and thence to the tower of the Coronado hotel.

Ballast Point Lighthouse consists of a white frame tower above a dwelling, near the N.E. extreme, showing a *fixed bright* light, elevated 30 ft., and visible 11 miles, but obscured by land westward of S. ⅜ E. In foggy weather, a *Bell* is struck by machinery, *once* every 10 *seconds*.

Within Ballast Point the channel is encumbered by the *Middle Ground*, with 2 to 3 fathoms over sand and shells, and liable to constant alterations; it reaches to within 1 cable of the point, the channel between having a depth of 9 fathoms. Its southern and western sides are marked by *buoys*. A 28-ft. channel has been dredged over its tail, to render navigation more easy for large vessels.

A fort has been constructed on Ballast Point, and at 1 mile within this is *La Playa Point*, southward of which is the *Quarantine Station;* here is a wharf, with a depth of 30 ft. alongside, where vessels can lie and be disinfected by steam, etc. A *fixed bright light* is shown on the wharf, and, in foggy weather a *Bell* is struck by machinery, *once* every 3 *seconds*. A government naval coaling station is to be formed in the vicinity, which will necessitate the removal of the quarantine station to a new site on the shoals to the North.

Above La Playa, the edges of the shoals bounding the channel are marked by pile *beacons, red* to starboard, and *black* to port, in entering, some bearing a *light*, as shown on the chart, *red* on starboard side, and *bright* on port side.

Page 209.—*Directions.*—In approaching San Diego with northerly winds, after passing San Clemente Island the course should be set for False Bay, as the pilots state that a southerly current of 2 knots an hour may then be expected. In entering, as before stated, vessels are recommended to pass eastward of the outer buoys, instead of going through the kelp. The anchorage outside the bar is not recommended with southerly winds. Ballast Point and La Playa lights in line, bearing N. 20° W., lead eastward of the outer buoys towards the bar.

Page 210.—**POINT LOMA Lighthouse** is now a white iron framework tower 60 ft. high, standing on the southern extreme. The light is *revolving*, every 20 *seconds*, the flashes being alternately *red* and *bright*, elevated 90 ft., and visible 15 miles.

At the bar, spring tides rise 5½ ft., and neaps 3¾ feet.

SAN DIEGO is a modern and improving town of over 25,000 inhabitants, being the focus of several railways, and is favoured with a dry and healthy climate. The surrounding country is well cultivated by means of irrigation, the rainfall being light, and yields fine lemons in large quantities. Petroleum is found in the vicinity, and the town is lighted by electricity. The imports were valued at £75,627 in 1904; the exports at £32,670; and the vessels entering numbered 354, with a tonnage of 252,615. Supplies of various kinds, including coal, sand and stone ballast, etc., can be had, and the town is now well supplied with fresh water. Fish is plentiful. A good hospital is maintained. There are several spacious wharves, with railway communication, alongside which the largest vessels can always lie afloat. It has been proposed to establish large steel-works in the vicinity.

At the N.E. extreme of North Coronado Beach Island, opposite the town, is a patent slip for vessels up to 1,200 tons, where repairs can be executed for hull and machinery.

In summer, the winds hereabout prevail between North and N.W., and in winter between South and S.W. The *Chinook, Norther*, or *Santa Ana* is a remarkably dry wind, and the air then becomes highly electrified. At San Diego the extremes of temperature registered are 32° and 101° F.

Page 211.—**San Luis Rey** is now of little importance, being superseded by the modern town and watering place named *Oceanside*, situated on the coast railway between San Diego and San Juan. A pier reaches into a depth of 3 fathoms at low water.

San Juan is a favourite modern watering place, picturesquely situated on the coast, about 3 miles from the old mission. The coast railway here turns inland, towards Los Angeles.

Newport Bay can only be entered by small vessels; steamers drawing up to 7½ ft. can get in at spring tides, and reach *Newport Landing*, about 2 miles within the bar, and now connected with the railway. The anchorage is in 8 to 10 fathoms, about 2½ cables off shore, whence *Mount Santiago*, with a conspicuous double peak 5,683 ft. high, bears N.E. by E., distant about 19 miles.

Lasuen Point, 2 miles westward of the bar, is a low bluff; about 3½ miles farther on is *Alpha Rock*, with only 3 ft. over it, 3½ cables off shore.

Page 212.—*Anaheim Landing* is now abandoned, *Anaheim* being connected with the railway system. The town contained 1,456 inhabitants at the census in 1900, and is the centre of a wine-making district. About midway between Anaheim and San Pedro is the seaside resort named *Long Beach*, with a large hotel, forming a good landmark.

Page 212.—**POINT FERMIN** is a rocky bluff 100 ft. high, forming the S.E. extreme of *San Pedro Hill*, 1,475 ft. high, and a prominent landmark. A rocky ledge, covered with kelp, extends 4 cables E.S.E. from it, southward of which a *red Whistle buoy* lies in 9 fathoms, 5 cables S.E. of the lighthouse.

The LIGHTHOUSE on Point Fermin is a square white structure above the keeper's dwelling, and now shows a *fixed bright* light, elevated 156 ft., and visible 17 miles.

Point Vicente is a rocky cliff 120 ft. high; about 3 cables S.W. of it is a *red Whistle buoy*, lying in 19 fathoms, with Point Fermin lighthouse bearing E. ¼ S., distant 6⅞ miles.

Pages 212-214.—**SAN PEDRO BAY** has come into prominence of recent years, owing to its selection for the construction of harbour works, at a cost of upwards of £1,000,000, in preference to Santa Monica, as the port of Los Angeles. A detached breakwater, about 1,000 yards in length, E. by S. ⅔ S. and W. by N. ⅔ N., is now approaching completion at 8 cables eastward of Point Fermin, terminating in a depth of 7 fathoms. It commences in a depth of 3½ fathoms, at 3½ cables off shore, with which it is connected by a trestle bridge. A small *fixed red light* is shown on the outer extreme of the works, at 1½ mile E. by N. ⅛ N. from Point Fermin lighthouse.

Between this outer breakwater and the entrance of the harbour there is much kelp, with some rocky patches. One of 3½ fathoms, with 6 fathoms around, lies 8 cables to S. by E. ⅞ E. from the light on Deadman Island breakwater, and was to be marked by a *spar buoy*, *red* and *black bands*. *Crapo Rock*, of 2¾ fathoms, lies 7½ cables E.S.E. of that island, and a *Bell buoy*, painted in *red* and *black bands*, lies close to its South side.

San Pedro Harbour has been improved by dredging and the construction of two stone jetties, one connecting Rattlesnake and Deadman Islands, and continuing about 300 yards S.E. by S. from the latter; the other extending more than half a mile S.E. from Timm Point, on the western side. By confining the action of the tide, these jetties have increased the depth over the bar to about 15 ft. at low water, but the latest chart shows 9 ft. outside the jetties. The aid of a pilot is necessary in entering, and, when within, there is shelter from S.E. gales.

On the western shore, within the jetties, is the new town of *San Pedro*, whither the custom-house establishment has been removed from Wilmington. Vessels drawing up to 21 ft. can reach the town at high water, and those drawing up to 18 ft. can lie afloat alongside the railway and other wharves at low water. Fresh and other supplies, coal, and water can be obtained here.

The channel up to *Wilmington* has a least depth of 6 ft. at low water.

Lights.—A *fixed red* light, elevated 16 ft., is shown on the extremity of the breakwater extending from Deadman Island. Another *red* light is shown on a beacon, on the East side of the harbour, at half a mile within.

Page 213.—**Los Angeles** contained 102,479 inhabitants at the census in 1900, and is growing quickly in importance, the residential population being estimated at 190,000 in 1905. It is now a large railway centre, and petroleum is plentiful in the vicinity. Large quantities of oranges, lemons, olives, walnuts, etc., are raised by means of irrigation, the average annual rainfall being only 16 inches, varying over a series of years between 5½ and 40 inches, and mostly falling from October to April.

The temperature is equable, the extremes registered being 28° and 105° F. The imports are chiefly iron, cement, and coal.

Page 214.—**MONICA BAY** is exposed to the prevailing winds, especially in winter, when gales from the S.E. and S.W. send in a heavy sea, dangerous for vessels at anchor. The soundings are deep and uneven, and in its S.E. part is a remarkable submarine valley (see the Addenda for pages 204-206), 100 fathoms being found within 1 mile of Redondo, and here petroleum rises to the surface in considerable quantities.

Rocky Point, 2 miles N.W. of Point Vicente, is 120 ft. high, and at 3 miles to the northward of it is *Malaga Cove*, where the cliffy coast ceases; with off-shore winds, there is anchorage in 6 or 7 fathoms, in the kelp, at 2½ miles N. by E. from Rocky Point.

Redondo, 2 miles northward of Malaga Cove, is a new town, where a good railway wharf has been constructed for the use of large vessels, there being 30 ft. alongside at low water, with mooring buoys off it. There is a custom-house here. Vessels can anchor in 8 to 15 fathoms, half a mile to 1 mile off shore, with the wharf bearing E. by N.; the deep submarine valley runs southward of this line.

Ballona, 8 miles N.W. ¾ N., is situated on a lagoon, where harbour works were commenced, but are now abandoned.

PORT LOS ANGELES, or Santa Monica, will probably decrease in commercial importance with the completion of the harbour works at San Pedro. The railway wharf is about 1,450 yards long, with depths up to 35 ft. alongside at low water, well provided with hydraulic cranes, sheds, etc., and mooring buoys on either side, for the use of large vessels. Fresh water is brought down to it in pipes. Supplies of various kinds, including coal and ballast, can be obtained here. A powerful steam-tug is always kept in readiness.

Lights.—Three *fixed* lights are shown on the end of the wharf, *red* at the N.W. side, *green* at the S.E. side, and *bright* in the centre, the latter being visible 12 miles. In foggy weather, a *Bell* is sounded continuously, one stroke about every 5 *seconds*.

A *red Whistle buoy* lies about half a mile S. by E. ½ E. from *Point Dume* or *Duma*, but is liable to drift.

In approaching Monica Bay at night, it is stated that some electric lights on *Mount Lowe*, at an elevation of 7,000 ft., and at least 35 miles inland, are visible far seaward in clear weather.

Sailing vessels bound here, should first make the land northward of the bay, owing to the prevailing N.W. winds and southerly current. There is good anchorage in 8 to 15 fathoms, about 2 miles off the wharf. The large hotel at Santa Monica, 2 miles south-eastward of the wharf, forms a good landmark.

Page 215.—**Point Hueneme** is a low white sandy coast, which will be easily recognised by the lighthouse and other buildings on it. Extensive wharves and warehouses have been constructed here, for the use of vessels shipping barley, wheat, and other agricultural productions. Good water can be had from an artesian well.

The Lighthouse is white, and now shows a *flashing bright* light, every 5 *seconds*. elevated 54 ft., and visible 11 miles.

A *red Whistle buoy* lies in 13 fathoms, 2 miles S. ⅝ E. from the lighthouse..

Page 216.—**Buenaventura** is connected with Los Angeles and Santa Barbara by railway, and has several petroleum refineries, the produce of which is conveyed to the wharf by a pipe for shipment. Considerable quantities of beans, barley, wheat, etc., are also shipped here. Good fresh water is plentiful.

SANTA BARBARA contained 6,587 inhabitants, at the census of 1900, and is a favourite health resort. Its electric lights are visible far seaward. The wharf extends into a depth of 20 ft., and a *red light* is occasionally shown 150 yards within its extremity.

A *Whistle buoy*, painted in *black* and *white stripes*, lies in 19 fathoms, nearly 2 miles E. ½ S. from the lighthouse on the bluff.

Page 217.—*More's Landing* is 4½ miles westward of Santa Barbara lighthouse, and here asphalte is shipped from a wharf reaching into 10 ft. water. At *Gaviota Landing*, 21 miles farther westward, is a wharf reaching into 16 ft. at low water.

Page 217.—**POINT CONCEPCION.**—A rock, with 3 ft. water over it, lies 4 cables W.N.W. of the lighthouse.

The Lighthouse is a low white tower above a dwelling, 39 ft. high; the light is elevated 135 ft., and visible 17 miles. In dry seasons, the *Fog Whistle* may be discontinued, or reduced in frequency, owing to the scarcity of water.

Page 218.—**CHANNEL ISLANDS.**—Owing to sheep being pastured on the islands of San Miguel, Santa Rosa, etc., and the consequent destruction of the herbage on the

shores, the strong N.W. winds of summer drift the sand over the islands, destroying most of the trees and shrubs. These islands are by tradition the site of buried treasure, and were at one time inhabited by a race of Indians, which became extinct in 1853. The sites of their villages are marked by heaps of shells.

Page 219.—**CORTES SHOAL.**—Northward of this is another bank, on which a least depth of 28 fathoms was found, at 17 miles N. by W. ¾ W. from Bishop Rock.

Page 220.—**SAN CLEMENTE ISLAND** is 18½ miles in extent, N.W. by W. and S.E. by E., by 1 to 4 miles in width, rising to an elevation of 1,964 feet. It is of volcanic origin, its shores mostly cliffy, and the vegetation consists of shrubs, cactus, etc. Fresh water is scarce and alkaline, but there are some rain-water tanks at *Wilson Cove*, on the eastern side of the North end of the island. It is visited occasionally by sheep-shearers; otherwise it is uninhabited.

Page 221.—**SANTA CATALINA ISLAND** is 18½ miles in extent, W. by N. ¾ N. and E. by S. ¾ S., with a greatest breadth of 7 miles, rising in its central part to a peak 2,109 ft. high, known as *Orizaba* or *Brush Mountain*. The coast is cliffy, rising in places steeply to an elevation of 1,400 feet. Vegetation is shrubby, with cactus. Wild goats are found among the hills, and rattlesnakes exist on it. There is a small village at the isthmus; and in a cove on the eastern part of the North coast is the bathing resort named *Avalon*, with hotel accommodation, and connected with San Pedro by a daily service of steamers.

Page 222.—**SANTA BARBARA ISLAND** is 1½ mile long, North and South, and 547 ft. high, with shrubby vegetation and cactus. Its centre is in lat. 33° 28½′ N., and there is reported to be an iron beacon on its summit. A rock awash lies in the kelp, 1 mile off the West point.

Osborn Bank, discovered by the U.S.S. *Gedney* in 1897, is 5½ miles in extent within the 100-fathoms line; the least depth found was 26 fathoms, lava bottom, about 6½ miles S. by E. ½ E. from the South end of Santa Barbara Island.

Pages 222-223.—**SAN NICOLAS ISLAND** averages 2½ miles in width, and is 890 ft. high. It is mostly covered with sand, with patches of coarse grass on which sheep find sustenance. In summer it is swept by strong winds, raising and shifting the sand in large bodies. Rumour has it that there is buried treasure on this island. No rocks are known to exist outside the surrounding kelp, but two reefs have been found among it, at 1½ mile W. by S. ½ S. from the western point. The best landing is at a narrow inlet on the North coast, 3½ miles from the West point, near a sheep pen and shearing shed. Off the N.E. (not S.E.) point, which is low and sandy, vessels may anchor in 10 fathoms, hard sandy bottom.

Page 223.—**John Begg Rock** lies 7¾ miles N.W. by W. ¾ W. from the N.W. point of San Nicolas Island, with depths of 50 fathoms close around, decreasing gradually towards the island. It is in lat. 33° 21¾′ N., long. 119° 41¾′ W.

Pages 223-224.—**ANACAPA ISLANDS** lie between long. 119° 21′ and 119° 26½′ W., and yield pasturage for a few sheep and goats. The western island is 980 ft. high. Anchorage can be found in 11 or 12 fathoms, among the kelp, North of the middle island, or on the southern side, off the passages between.

Page 224. —**SANTA CRUZ ISLAND** rises to an elevation of 2,400 feet. A wharf has been constructed in *Prisoner Harbour*, for small vessels.

Page 225.—**SANTA ROSA ISLAND** is 14½ miles in extent, East and West, and rises to an elevation of 1,562 feet. It supports large numbers of sheep, and there is a small settlement at *Becher Bay*, about 1½ mile southward of the North point, with a wharf reaching into 16 ft. water. There are several off-lying sunken rocks around its shores, as shown on the chart, but none much more than 1 mile off.

Pages 225-227.—**SAN MIGUEL ISLAND** is 7½ miles in extent, E. by N. and W. by S., by 2 miles in greatest width, and rises near its centre to two peaks, 861 ft. high. In summer, it is frequently enveloped in fog. It has more detached dangers around it than the other islands, as will be seen by referring to the chart. *Richardson Rock*, the outermost, is 50 ft. high, lying 5½ miles N.W. ¾ W. from the western point of the island. *Wilson Rock* is 15 ft. high, with a reef stretching 1 mile W. ¾ N. from it. At 3 miles North of the western point is a patch of 4 fathoms, and petroleum here rises to the surface.

Cuyler Harbour is fronted by *Prince Islet*, 303 ft. high. The mouth of the stream is in about lat. 34° 2¾′ N., long. 120° 21′ W.

Page 227.—**ARGUELLO POINT** is a long dark projection 40 ft. high, and must be given a wide berth during the fogs of summer.

The Lighthouse is a square white wooden tower, standing on the extremity of the point, and showing a *fixed bright* light, elevated 91 ft., and visible 15 miles. In foggy weather, a 12-inch *Whistle* sounds a blast of 2 *seconds* in every *half-minute*. At 4½ miles to E. by N. ¾ N. is *Mount Tranquillon*, a triple peak 2,136 ft. high, a good landmark.

Pedernales Point, 1¾ mile northward of Arguello Point, is a conspicuous black rocky projection, 150 ft. high, with rocks extending 3 cables off it. For 6 miles northward of this the cliffs are covered with white sand.

Purissima Point, 12 miles northward of Arguello Point, is low and rocky. At 1¾ mile S.E. of it is *Lompoc Landing*, where the railway wharf extends into 14 ft. water. Agricultural produce is shipped here.

Sal Point, 9 miles N.W. by N. ½ N. from Purissima Point, is 200 ft. high, with rocks extending nearly half a mile off it. Anchorage may be found in 7 to 9 fathoms, sand, in the bight S.E. of it, fairly sheltered from the prevailing N.W. winds. Here was a wharf, with warehouses, but they have been removed to San Luis Obispo bay.

SAN LUIS POINT, the N.W. extreme of San Luis Obispo Bay, is rocky and rises quickly to an elevation of 700 feet. At 1 cable off it is *Whaler Islet*, 75 ft. high, in long. 120° 45′ W.; whence a breaking reef extends 4 cables S.E. by E. A breakwater now connects the islet with the shore, and is being continued seaward over the reef; when completed it will be about 2,000 ft. long.

The Lighthouse, 2½ cables westward of San Luis Point, is a dwelling with a white tower above it, 30 ft. high, showing a *revolving* light every *half-minute*, alternately *red* and *bright*, elevated 133 feet, and visible 17 miles seaward, between N. 37° E. and N 83° W. In foggy weather, a *Whistle* sounds a blast of 5 *seconds* in every 40 *seconds*.

At 2¾ miles westward of the lighthouse is *Pecho Rock*, 31 ft. high, lying half a mile off shore, with a small rock, awash at high water, lying 4 cables to W. by S. ¼ S.

Pages 227-228.—**SAN LUIS OBISPO BAY** is encumbered with several off-lying rocks, but affords fairly sheltered anchorage, behind the breakwater constructing off San Luis Point.

Page 228.—The railway wharf at *Port Harford*, 7 cables northward of San Luis Point, extends 600 yards into a depth of 20 feet. The wharf at *Avila* is now little used. There is railway communication with San Francisco, etc.

Santa Rosa Reef, 1⅓ mile S.W. by W. ½ W. from the lighthouse, has 3 fathoms least water over it; at half a mile S.E. of it is *Westdahl Rock*, a 3-fathoms pinnacle, with a *black can buoy* lying in 18 fathoms, 1 cable S.W. of it.

Souza Rock, a 16-ft. pinnacle, lies 2 miles S.E. ¾ S. from Whaler Islet, with 20 fathoms close around; a *Bell buoy*, painted in *red* and *black bands*, lies in 20 fathoms, 1¾ cable South of it.

Howell Rock, 1¼ mile E. by N. from Whaler Islet, has 14 ft. over it; a *red nun buoy* lies in 10 fathoms, 1½ cable S.S.W. of it.

The two latter buoys should be left to starboard in approaching Port Harford. The *Whistle buoy* no longer exists.

Monte de Buchon attains an elevation of 1,883 ft. at *Saddle Peak*.

The surveyors could find no trace of the sunken rock reported to lie 8 miles S.S.W. of San Luis Point, and it has been erased from the charts.

Page 229.—**Buchon Point,** 8 miles W.N.W. of San Luis Point, terminates in a cliff 40 ft. high, with sunken rocks extending 4 cables off it. A *red Whistle buoy* lies in 16 fathoms, about 1 mile W. by N. ½ N. from the point.

Lion Rock, 112 ft. high, lies 3 cables off shore, at 2⅔ miles south-eastward of Buchon Point, and has a low rock 1 cable West of it.

El Morro Rock is 573 ft. high; the lagoon entrance, eastward of it, is very narrow, with 9 ft. water in it.

At *Cayucos Landing*, in the N.E. angle of Esteros Bay, is a wharf reaching into 14 feet water, but it is fronted by reefs and foul ground, some marked by buoys. *Mouse Rock*, 4 cables southward of the wharf, is marked by a *black Bell buoy*, lying in 6½ fathoms, S.E. of it. *Constantine Rock*, with 8 ft. over it, lies 3⅛ miles E. by S. from Esteros Point; a *black can buoy* lies in 6½ fathoms, 1 cable South of it.

Von Helm Rock, with 15 ft. over it, lies 8 cables off shore, at 7 miles north-westward of Esteros Point, with White Rock bearing E. ⅛ S., distant 1¼ mile. A *red nun buoy* lies in 20 fathoms, 150 yards W.S.W. of it.

San Simeon Bay is clear of detached dangers. A wharf reaches into 16 ft. water, with mooring buoys off it; the best anchorage is in 3¾ fathoms, eastward of it.

Piedras Blancas Rocks.—The outer rock is 130 ft. high, and lies in lat. 35° 39¾′ N., long. 121° 17¼′ W.; a *red Whistle buoy* lies in 15 fathoms, 3¾ cables W.S.W. of it.

Page 230.—*Harlech Castle Rock* lies about half a mile off shore. During the survey, in summer, a N.E. current was found setting along this shore, for 1 mile off; farther out, it was setting S.E.

Between the Piedras Blancas and Point Sur the coast becomes very mountainous, with peaks up to 6,000 feet. *Cape San Martin*, 14 miles from the Piedras Blancas, rises steeply to 2,700 ft., and at two-thirds of a mile off it is a pinnacle rock 134 ft. high. A small black rock is reported to lie 1 mile off shore, about 5 miles north-westward of this cape.

POINT SUR rises to an elevation of 358 ft., and has some rocky patches extending 2 cables off it.

The Lighthouse is a square gray stone tower, 38 ft. high, in lat. 36° 18¼′ N., long. 121° 54′ W., showing a *revolving* light every 15 *seconds*, the flashes alternately *red* and *bright*, elevated 272 ft., and visible 23 miles. In foggy weather, a *Whistle* sounds a blast of 5 *seconds* in every 40 *seconds*.

In August, 1904, Capt. J. N. Ross, of the steamer *San Mateo*, sounded in 24 fathoms, broken shells, at 3¾ miles S.W. of Point Sur lighthouse, and in 56 fathoms, fine sand, at 4¼ miles S. by W. ⅝ W. from it.

Ventura Rocks, 2½ miles N.N.W. of Point Sur, are two rocky islets lying half a mile off shore.

Page 231.—**POINT PINOS Lighthouse** is painted white. A *red Whistle buoy* lies in 23 fathoms, about three-quarters of a mile N.W. ½ W. from it.

In 1891, Captain J. H. Cameron, ship *J. B. Brown*, when in lat. 36° 40′ N., long. 123° 30′ W., or about 75 miles westward of Point Pinos, passed through some very muddy water, 14 miles in extent N.W. and S.E., and saw what appeared to be a heavy tide-rip. No soundings were taken, but a depth of nearly 2,000 fathoms has been found a few miles southward of this position.

Page 232.—**MONTEREY BAY.**—*A red Bell buoy* lies in 20 fathoms, 3½ cables off Mussel Point, about 1 mile northward of the town.

Page 233.—**Monterey** has increased in size of recent years. The railway station is very conspicuous. The wharf extends 800 ft., into a depth of 16 feet.

At 1 mile southward of *Salinas River* entrance, at the head of the submarine valley, is *Moss Landing*, with a railway wharf, reaching into 10 ft. water. There are similar wharves at *Pajaro*, *Aptos*, and *Sauquel*, farther northward, but not connected with the railway.

Pages 233-234.—More recent examination has modified the description of the submarine valley, as shown on the chart.

Page 234.—**SANTA CRUZ HARBOUR** has two wharves on its N.W. side, reaching into 10 ft. water, one connected with the railway. The best anchorage is in 5½ fathoms, three-quarters of a mile N.E. ½ E. from the lighthouse. A *Whistle buoy*, painted in *black* and *white stripes*, lies in 10 fathoms, 1⅜ mile E. by S. ¾ S. from the lighthouse.

The Lighthouse is now situated about 200 yards within the extremity of Santa Cruz Point; the light is visible 8 miles.

Page 235.—**Point Ano Nuevo.**—A *fixed bright light*, elevated 24 ft., and visible 8 miles, is shown on a post in front of the white buildings of the Fog Signal station.

Ano Nuevo Islet has a 3-fathoms reef extending half a mile E.S.E. from it, and a 9-ft. rock lies in the kelp near its extremity. Kelp also extends 1⅓ mile to N.W. by W.

Vitula Shoal, upon which several vessels have reported depths of 5 or 6 fathoms, was said to lie about 70 miles W. ½ S. from Pigeon Point. Depths of about 2,000 fathoms have been found around this region.

Pages 236-237.—**HALF-MOON BAY** is protected by the reefs from the N.W., but is quite exposed to the S.E. The coasting steamers lie alongside the wharf at *Amesport*, which reaches into 12 ft. at low water; off it are some mooring buoys. *Pillar Point* rises to an elevation of 181 feet.

The S.E. extremity of the *Inner Reef* is marked by a *black can buoy*, lying in about 9 fathoms, 1 mile S.E. by E. ½ E. from Sail Rock. The northern end of the *Outer Reef* is marked by a *red nun buoy*, 1½ mile S.E. ½ E. from Sail Rock.

Page 237.—**Montara Point.**—A *fixed red light*, elevated 55 ft., is shown at 100 yards W. by S. from the white buildings of the Fog Signal station. The *Whistle* now sounds a blast of 5 *seconds* in every *half-minute*.

Montara Mountain, 2½ miles N.E. by N. from Montara Point, is 1,940 ft. high, forming a good landmark; from sea it appears to terminate in three small peaks.

Point San Pedro is 640 ft. high. Northward of it the coast continues steep and rocky, rising to an elevation of 720 ft. at *White Cliff*, 6½ miles distant. Northward of this the coast becomes sandy, and at 3 miles southward of Lobos Point is *Ocean Side House*, a conspicuous building.

Pages 238-249.—**SAN FRANCISCO HARBOUR** has an area of about 450 square miles, affording ample accommodation for vessels of the largest size. Pilots may always be found cruising outside the bar; their services are not really necessary, as there is no great difficulty in the navigation, but vessels not employing them have to pay the rate; if not spoken till inside the bar, the rate is reduced to one-half. At present (1906), vessels under 500 tons register pay 3 dollars per foot of draught; vessels over 500 tons pay in addition 3 cents per register ton. Whalers and fishermen are exempt.

All attempts to get the excessive charges for port dues and towage reduced have been so far unsuccessful.

Rule of the Road for Inland Waters.—(See the Addenda for pages 204-206). These rules are in force in the port of San Francisco within or eastward of a line drawn to S.E. ⅞ S. from Bonita Point lighthouse to Lobos Point. Anchorage is prohibited in certain areas, to avoid obstructing the approaches to the wharves and piers of San Francisco and Oakland, or damaging the submarine cables and water-pipes running from the Oakland jetties to Yerba Buena Island. These areas are marked on the large-scale chart.

Pages 239-240.—**SAN FRANCISCO** contained 342,782 inhabitants at the census in 1900, and is of growing commercial importance. In 1904, the vessels entering, inclusive of the coasting trade, numbered 880, with a tonnage of 1,549,456. The exports by sea were valued at £10,653,687, chiefly wheat, flour, barley, tinned salmon and fruits, etc., and including bullion worth £3,029,749. The imports by sea and rail were valued at £17,693,043, chiefly raw silk, coffee, coal, tea, and rice, and including bullion worth £9,011,047. The wharfage accommodation has been increased and improved, and the largest vessels can lie afloat alongside, to receive or discharge cargo, coal, etc. A Seamen's Institute is maintained.

Supplies of fresh meat, bread, vegetables, and fruit are plentiful, but ship's stores, etc., are expensive. English, Australian, and Vancouver coal can be supplied at the wharves or from hulks. Good fresh water can be obtained from hydrants, or is brought off in tank-boats.

Time Signal.—On the tower of the ferry building, at the foot of Market Street, 1,400 yards S. 66° E. from Telegraph Hill, a black ball is hoisted daily, except Sunday, to an elevation of 364 ft., at 11h. 50m. a.m., and dropped at mean noon, of long. 120° W., equivalent to 8h. G.M.T. It is in lat. 37° 47′ 38″ N., long. 122° 23′ 37″ W.

There are government *wireless* telegraph stations on the Farallones, Yerba Buena Island, and at Mare Island Navy Yard.

Page 240.—The old graving dock at Hunter Point is 490 ft. long, with an entrance 82 ft. wide, with 22 ft. over the sill at high water springs. Adjoining it is a larger dock, completed in 1903, 750 ft. long, with an entrance 103 ft. wide, having 28 ft. over the sill at high water. Besides these, the port has three pontoon docks 210, 271, and 301 ft. in length, respectively, and available for weights up to 2,000 tons. There are also patent slips for weights up to 1,000 tons. At the Union Iron works and ship building yards at Potrero is a hydraulic lift-dock, 446 ft. long, by 62 ft. wide, with 20 feet over the blocks, capable of raising a weight of 4,000 tons. Repairs of any magnitude can be executed for vessels and their machinery.

Page 241.—**Point Bonita.**—A rocky pinnacle, reported to be visible at lowest tides, lies 2¼ cables S.W. ½ S. from the old lighthouse. There is good anchorage in 7½ fathoms, eastward of the point, at 2 cables off shore, with Alcatraz Island just shut in by Diablo Point, and Ocean Side House in line with the inner edge of Seal Rocks. The fog signal station is now 22 yards W. by S. ¼ S. from the lighthouse, and the *Siren* sounds a blast of 5 *seconds* with intervals of 35 *seconds*. When vessels are in distress, it will sound 5 or 6 short blasts, and then a blast of 15 seconds, to summon the lifeboat.

Point Lobos.—The *Fog Bell* is discontinued. A *red buoy* is reported to lie off the telegraph cable station. *Seal Rocks* are four in number; the S.W. rock is 43 ft. high, and is perforated.

Page 242.—**Mile Rocks Lighthouse**, established in 1906, is a white steel tower, on the outer and larger rock, showing a *fixed red* light, elevated 78 ft., and visible 14 miles. In foggy weather, a *Whistle* sounds a blast of 3 *seconds* in every *half-minute*. A 13-ft. rock lies 1½ cable S.E. by S. ⅛ S. from the rocks.

Fort Point.—A large *red nun buoy*, No. 2, lies in 8 fathoms, outside the rocks, and 326 yards off the wall below the red brick fort, with the lighthouse bearing S.E. $\frac{1}{3}$ E.

The Light on Fort Point is now *flashing* every 5 *seconds*, the flashes being *red* and *bright* alternately.

Vessels are recommended not to anchor in the bight between Lobos and Fort Points. There is a life-saving station at $1\frac{1}{4}$ mile South of Fort Point, and another 7 cables E.S.E. of that point.

Pages 242-243.—**The Lighthouse** on Fort Point is 27 ft. high. The light is *fixed bright* for 1 minute, and then shows *four red flashes*, one every 15 seconds. In foggy weather, a *Trumpet* sounds a blast of 2 *seconds* in every 15 *seconds*; if not available, the *Bell* is struck once every 10 seconds.

Page 243.—**The BAR.**—Ordinary vessels can cross the bar as convenient, but those of deep draught are recommended to use the deeper channels across it. The *Main Ship Channel*, across the central part, has a least depth of 34 ft. at low water, on the leading line of Fort Point and Alcatraz lighthouses. *Bonita Channel*, between the Four-fathoms Bank and the shore, has $8\frac{1}{2}$ fathoms in it, and is often used by large steamers. *South Channel* runs parallel with the shore, southward of Lobos Point, and has 34 ft. least water, but is not recommended in very rough weather.

SAN FRANCISCO HARBOUR LIGHTVESSEL is painted red, with two masts and a funnel between, lying (1906) in about 19 fathoms, 3 miles to the S.W. of the Main Ship Channel, and just northward of the leading line, with Fort Point lighthouse bearing N.E. $\frac{7}{8}$ E., distant about $10\frac{7}{8}$ miles; it appears to be liable to drift. *Two revolving bright* lights are shown, visible 5 seconds, eclipsed 10 seconds, one on each mast, elevated 57 ft., and visible 13 miles. In foggy weather, a *Whistle* sounds a blast of 2 *seconds* in every *half-minute*. When removed for repairs, etc., the station is marked by a gas-lighted buoy.

Buoys.—On the establishment of this lightvessel, in 1898, the outer *Whistle buoy* was withdrawn. *Inside Bar buoy*, *nun*, *black* and *white stripes*, now lies in about 9 fathoms, 3 miles S.W. by S. from Bonita Point lighthouse, and near the leading line. The other striped buoy has been withdrawn.

The *Bell buoy* on the southern part of the bar has been withdrawn. *South Shoal buoy*, *nun*, *red* and *black bands*, lies in 5 fathoms, $5\frac{2}{3}$ miles S.W. by S. $\frac{3}{4}$ S. from Bonita Point lighthouse, and should not be approached within half a mile; with a heavy swell the sea breaks near it.

In *South Channel*, a *red nun* buoy (Ocean Side No. 2) lies in $6\frac{1}{2}$ fathoms, 6 cables W. $\frac{5}{8}$ S. from Ocean Side House. A similar buoy (Golden Gate Park No. 4) lies in $6\frac{3}{4}$ fathoms, 3 miles S. by E. $\frac{7}{8}$ E. from Bonita Point lighthouse. Vessels must not pass inshore of them.

Page 244.—*Four-fathoms Bank buoy*, marking the East end, is now a *nun*, *red* and *black bands*, lying in 5 fathoms, half a mile S.W. by W. $\frac{1}{2}$ W. from Bonita Point lighthouse. The *black can buoy*, marking the West end of the bank, has been moved outside the bar, and now lies in $7\frac{1}{2}$ fathoms, $5\frac{1}{4}$ miles S.W. by W. from Bonita Point lighthouse. A *red nun buoy* lies in $8\frac{1}{4}$ fathoms, off the N.W. side of the bank, at $3\frac{3}{4}$ miles W. $\frac{2}{3}$ S. from Bonita Point lighthouse. A *red nun buoy* lies in $7\frac{3}{4}$ fathoms, off the North side of the bank, at $1\frac{2}{3}$ mile W. by N. $\frac{1}{4}$ N. from the lighthouse.

Sears Rock, of 3 fathoms, lies in the middle of Bonita Channel, and S.S.W. of it is *Centissima Rock*, of $4\frac{1}{2}$ fathoms, at $13\frac{1}{4}$ cables W. by N. $\frac{1}{2}$ N. from Bonita Point lighthouse, and only 40 yards northward of the leading line shown on the chart. A *black can buoy* lies on its South side, and must be left on the port hand in entering.

Page 244.—**Lime Point.**—A *fixed bright* light is shown from a lantern, elevated 19 feet, on the white building of the fog signal station. When vessels are in distress the *Fog Whistle* is sounded as at Point Bonita.

Page 245.—**SAN FRANCISCO.**—The approaches to the wharves and piers have been improved by dredging. The anchorage is fairly sheltered, even from S.E. storms, but the holding ground is not very good. The tidal streams here run over 2 knots an hour. (See the Addenda for pages 238 and 239).

Telegraph Hill is surmounted by a white castellated building. A *fixed bright electric light* is shown here, at an elevation of 350 ft., as a guide for the ferry-boats; being visible 23 miles, it may be seen far seaward where not obstructed by intervening hills.

ALCATRAZ ISLAND and Light.—The *buoy* off the N.W. side has been withdrawn. The lighthouse is a white tower above a dwelling, 36 ft. high, near the S.E. end; the light is now *flashing bright* every 15 *seconds*. The *Fog Bell* on the

S.E. end is now struck *five* blows at intervals of 10 seconds, followed by an interval of 25 seconds. Another *Fog Bell*, on the N.W. end, is struck *once* every 6 *seconds*.

A Tidal Indicator is established off the S.E. extreme of Alcatraz Islet. It is a large white semicircle, marked with lines and figures, a pointer showing the depths between 8 ft. above and 2 ft. below mean low-water level. An arrow-head in the centre points upward while the tide is rising, and downward while it is falling.

Presidio Shoal buoy now lies in 23 ft., near the middle of the shoal, and 1⅛ mile N.E. by E. ½ E. from Fort Point lighthouse; it shows an *intermittent bright light*, visible 10 seconds, eclipsed 10 seconds.

Page 246.—**Bird or Arch Rock** was about 30 ft. high, but it has been removed by blasting, and there is now a depth of 30½ ft. over its site at low water.

Shag Rock, about one-third of a mile N. 16° W. from Arch Rock, has been removed by blasting, and there is now a least depth of 32 ft. over it at low water The 3-fathoms rock, 150 yards to E.S.E., has also been blasted to a depth of 30 ft. at low water.

Blossom Rock has also been blasted to a depth of 31 ft. at low water. The *buoy* has been removed.

Yerba Buena or Goat Island.—A *red nun buoy* lies in 3½ fathoms, on the North end of the bank extending N.W. by N. from the island.

Vessels must not anchor between Yerba Buena Island and the Oakland wharves, to avoid injuring the telegraph cables and the water-pipe for the Naval Training Station on the island. Storm signals are exhibited at the wireless telegraph station.

The Lighthouse is painted white, and the light is visible 13 miles.

Page 247.—**OAKLAND HARBOUR.**—The railway wharves have been enlarged, and the largest vessels can lie afloat alongside. The training walls at the creek are completed, and the channel dredged to 20 ft. at low water. There is a custom-house here, and the dues and charges are lower than at San Francisco. There is a patent slip, which can raise weights up to 600 tons.

Lights.—A white pile lighthouse stands in about 10 ft. water, 125 yards westward of the end of the North jetty of San Antonio Creek entrance, and shows a *fixed bright* light, elevated 45 ft., and visible 12 miles. In foggy weather, a *Bell* is struck *once* every 5 *seconds*.

On a red frame structure, in 13 ft. water, near the end of the South training wall, is shown a *fixed red* light, elevated 20 ft., and visible 6 miles.

A *black spar buoy* lies in 16 ft., 3¾ cables W. ½ N. from the lighthouse; vessels entering the creek must pass southward of it.

A 4¾-fathoms patch, about 4½ cables south-eastward of Rincon Point, San Francisco, is marked by a *nun buoy*, painted in *red* and *black bands*. A similar buoy marks a 4½-fathoms patch about 6¾ cables E. ¾ S. of the same point, and carries an *occulting bright light*, visible 5 seconds, and then eclipsed 5 seconds.

ANGEL ISLAND has a military post on its S.W. side, and a quarantine station at Hospital Cove, on its N.W. side. Shoal water extends 2½ cables southward of *Knox Point*, the S.W. point; off *Blunt Point*, the S.E. extreme, is a sunken rock, marked by a *can buoy* painted in *red* and *black bands*, lying in 10 fathoms eastward of it.

Light.—Above the white Fog Signal building on Knox Point is shown a *fixed red* light, elevated 34 feet. In foggy weather, a *Bell* is struck *twice* in quick succession every 15 *seconds*.

Cavallo Point, half a mile N. by E. ½ E. from Lime Point, is 80 ft. high.

Page 248.—**Saucelito** anchorage is resorted to by yachts and other vessels, being out of the strong tidal currents. Vessels lie in 4 to 10 fathoms, good holding ground.

At *Tiburon Point*, on the North side of Raccoon Strait, is a terminus of the North Pacific Coast Railway.

At *Richmond Point*, to N. by E. of Angel Island, is the terminus of the Southern Pacific Railway, connected with San Francisco by a line of ferry steamers.

Southampton Shoal Lighthouse, established in December, 1905, is a square building standing on piles, in 9 ft. water, on the southern part of the shoal, showing a *fixed bright* light, elevated 52½ feet. In foggy weather, a large *Bell* is struck *twice* in succession at *alternate* intervals of 5 and 15 *seconds*.

Red Rock is 178 ft. high; at 2 cables S.E. ¼ S. from the summit, and in 28 ft. water, is a *buoy*, painted in *red* and *black bands*, bearing an *intermittent bright light*, visible 10 seconds and then eclipsed 10 seconds.

Quarantine Buoys.—The limits of the area for vessels in quarantine are marked by four *yellow can* buoys, lying respectively S. ⅜ W., S. ¼ E., S. by W. ⅛ W., and S. ½ W. from East Brother Islet lighthouse, and with Red Rock bearing N.E. by N. ⅜ N., nearly 2 miles distant, N. by E. ¾ E. 1⅛ mile, N.E. ⅛ E. 1¾ mile, and N.E. ⅛ E. 1¼ mile.

The rocks off *San Pablo Point* and *Brother Islets* are marked by buoys.

East Brother Islet Lighthouse is painted white, and the light is now *fixed bright*. The *Fog Whistle* sounds *alternate* blasts of 4 *seconds* and 6 *seconds* at intervals of 24 *seconds*.

The fairway channel through *San Pablo Bay* to Karquines Strait has a least depth of $3\frac{1}{2}$ fathoms at low water, and is marked by *buoys* lying in mid-channel. It is now being dredged to 28 ft. at low water, to enable large war-vessels to reach the Navy Yard at Mare Island.

Page 249.—**Mare Island Strait,** *or Napa Creek.*—On the East side of the entrance, at half a mile eastward of Mare Island light, is a pile *beacon*, on which a small *fixed bright* light is shown. The channel is liable to alteration, and, in 1896, was found to have only 17 ft. at low water near Commission Rock.

At the Navy Yard there is a dry dock 510 ft. long, with an entrance 79 ft. wide, having 27 ft. over the sill at high water springs. A sectional dock, 350 ft. long, can raise weights up to 4,000 tons. Another large dry dock is to be constructed for battleships up to 15,000 tons; it is to be 750 ft. long, with 30 ft. over the sill. A *Time Ball* is dropped at noon, of long. 120° W., equivalent to 8h., G.M.T.

At *Port Costa*, Karquines Strait, opposite Benicia, are some large grain warehouses, where vessels can lie afloat in 26 ft. least water. Between this and Martinez are some coal depôts and grain stores, off which there are sometimes large numbers of sailing vessels.

SACRAMENTO RIVER has been dredged to a least depth of 7 ft. at low water up to Sacramento. *Joaquin River* has been dredged to 9 ft. up to *Stockton*, where there is a large glass factory.

Pages 250-253.—**DIRECTIONS.**—The foregoing pages must be read in connection with the sailing directions here given. The lightvessel outside the bar is a valuable aid to the outer navigation.

Masters of sailing vessels must remember, in laying their course for San Francisco, that N.W. winds prevail in the offing from May to October; and that, during the rest of the year, the winds are more southerly, perhaps setting in from S.E., with rain, then passing by South and S.W. to N.W., with clearer weather from the latter direction.

Pages 253-254.—*Climate.*—Long series of observations show that at San Francisco the warmest month is September, and the coldest January. Extremes of 100° and 29° F. have been registered. Regular observations, made continuously from 1850 to 1900, show that the average annual rainfall is 25 inches, ranging between extremes of $7\frac{1}{2}$ and $52\frac{1}{4}$ inches. In July and August it rarely rains, but 10 inches have fallen in December and January together. Snow is seldom experienced, though on February 5th, 1887, there was a fall of 7 inches.

From May to September, little rain falls, but every afternoon great banks of fog are brought in by the prevailing westerly winds, and envelop the city. Outside the Golden Gate the fog may extend over an area 10 miles square.

Page 254.—**Duxbury Reef** is now marked by a *black Whistle buoy*, lying in 12 fathoms, about $1\frac{7}{8}$ mile S.E. by S. $\frac{3}{4}$ S. from Duxbury Point. The former buoy is discontinued.

Page 255.—**SIR FRANCIS DRAKE'S BAY** is so named as being considered to be the anchorage where the *Golden Hind* lay and refitted in 1579, when this famous navigator called the country *New Albion*.

Page 255.—**Mount Tamalpais**, or *Table Mountain*, when seen from the South or S.W., appears to have three peaks, of which the westernmost is the highest. It is covered with bushes and low trees, forming a strong contrast with the adjacent grassy hills. There is an observatory on it.

Page 256.—**POINT REYES Lighthouse.**—The *Fog Signal* is now a *Whistle*, sounding a blast of 5 *seconds* at intervals of 70 *seconds*. There is a *Signal Station* here. A *Lifeboat* is stationed 3 miles to N. by E., and when its services are needed, the whistle sounds 5 or 6 short blasts followed by a blast of 15 seconds.

Blue Mountain is 918 ft. high.

Pages 256-257.—**Cordell Bank** is about 2 miles in extent, and half a mile wide, within the 30-fathoms line. A depth of 19 fathoms, red coral, has been reported on it, at 19 miles W. by S. $\frac{1}{4}$ S. from Point Reyes.

Page 257.—**SOUTH FARALLON.**—The supplies for the lighthouse are landed at a cove formed by some rocks, on the North side. There is a government wireless

telegraph station here, and also telegraphic cable communication with San Francisco, whereby vessels can be reported, and tugs, etc., obtained.

Page 258.—The rock reported by the pilots, between the South and Middle Farallones, was not found when searched for.

Middle Farallon is 22 ft. high.

NORTH FARALLONES.—The highest rises to an elevation of 155 ft., the N.W. islet being 118 ft. high.

Page 259.—The 4-fathoms rock, reported to lie 2 miles to the S.E., was not found when searched for.

Noonday Rock lies nearly 3 miles W. $\frac{1}{2}$ N. from the N.W. Farallon, with depths of 38 to 41 fathoms between. At 2 cables S.W. $\frac{3}{4}$ S. from it lies a *Whistle buoy*, painted in *red* and *black bands*.

The Farallones are frequently enveloped in fog, and the currents are uncertain in their vicinity.

Pages 259-260, 1109*.—**Reed Rocks** were not seen from the schooner *Norway*, in the given position, in 1889, in clear weather with a calm sea; and other vessels have reported their non-existence. In 1899, however, Capt. T. Harkins, schooner *Una*, reported that when in lat. 37° 24′ N., long. 137° 26′ W., he passed within about 200 ft. of a peaked rock, appearing about 4 ft. above the water, with seaweed on it; the weather was hazy, and no soundings were taken.

In 1901, the U.S.S. *Wheeling* made an exhaustive but unsuccessful search for these rocks, and the U.S. hydrographic authorities consider these reported dangers cannot exist.

Page 261.—**BODEGA BAY.**—Vessels drawing up to 7 ft. can cross the bar of the *Estero Americano* at low water.

Page 262.—**Russian River.**—The railway is now extended along the coast to Fort Ross.

Fort Ross.—In 1902, a sunken pinnacle rock, with 13 ft. over it at half-tide, was reported to lie about 1 mile off shore, and $1\frac{3}{4}$ mile S.E. $\frac{1}{8}$ S. from the point on the N.W. side of the entrance to the cove; it only breaks during heavy weather. In 1904, there were reported to be two pinnacles about 100 yards apart.

Page 263.—*Walalla* is the terminus of a branch railway.

Saunders Reef, 8 miles S.E. of Arena Point, is visible at low water, and extends about two-thirds of a mile off shore. A *red Whistle buoy* lies in 16 fathoms, half a mile southward of it, and 2 miles W. by N. from Sail Rock; it is liable to break adrift.

A *Bell buoy*, painted in *black* and *white stripes*, lies in 15 fathoms, off *Arena Cove*, and $2\frac{1}{2}$ miles S.E. by S. from Point Arena.

Page 264.—**POINT ARENA** has foul ground extending $1\frac{1}{3}$ mile N.W. by W. from it, the outer rock, with 13ft. over it, being usually marked by breakers.

Between Point Arena and Ten Mile River are numerous open coves and anchorages, where steam schooners ship timber in large quantities. *Elk Creek* and *Navarro River* have branch railways to them. All this coast is bordered by kelp, especially in summer, growing in depths up to 20 fathoms.

Pages 264-265.—**MENDOCINO BAY** has some heavy moorings. When vessels can enter, a flag is hoisted; when at half-mast, they must keep off.

Page 265.—**Fort Bragg Cove,** $8\frac{1}{2}$ miles northward of Mendocino Bay, is about 200 yards in diameter, with 9 fathoms and under. It has a branch railway. A *Whistle buoy*, painted in *black* and *white stripes*, lies in 20 fathoms, half a mile W. by S. from the entrance.

Page 266.—**Shelter Cove** is eastward of *Delgada Point*, which is fronted by sunken rocks extending half a mile southward of it. It is quite open to the S.E., but will afford shelter from summer gales. A *black Bell buoy* lies in $12\frac{1}{2}$ fathoms, 1 mile S.E. $\frac{5}{8}$ E. from the wharf, with Delgada Point bearing N.W. by W. $\frac{1}{4}$ W.

Tolo Bank fronts the coast southward of Shelter Cove, and a least depth of $7\frac{3}{4}$ fathoms has been found on it, at 3 miles S. by E. $\frac{1}{2}$ E. from Delgada Point. The swell sometimes breaks here in depths under 10 fathoms.

Between Delgada Point and Cape Mendocino, 30 miles to N.W. $\frac{1}{2}$ W., the coast is approached by four submarine valleys, in lat. 40° $6\frac{1}{2}$′, 40° 9′, 40° 18′, and 40° 22′, respectively, as shown on the chart. Vessels approaching this coast in foggy weather must be extremely careful not to be misled by soundings; in the southern valley 100 fathoms is found within half a mile of the shore, and 25 fathoms close to the rocks under the cliffy coast.

A *red nun buoy* lies in 22½ fathoms, 2½ cables S.W. of *Rodgers Breaker*, about 4½ miles S.E. of Punta Gorda.

Punta Gorda, 800 ft. high, is fronted by rocks reaching 2 or 3 cables off, the outermost being a detached rock 15 ft. high.

Page 266.—**CAPE MENDOCINO** is frequently enveloped in fog, and along the coast northward of it the rainfall is much heavier than along that southward of it. Northward of the cape the prevailing winds are from N.N.W. to N.W. in summer, and from S.W. in winter and spring.

In 1870, when the U.S. surveyors were becalmed for five days off Cape Mendocino, the eddy current setting northward was found to extend 15 miles off shore, running about 1½ knot an hour. In September, 1898, H.M.S. *Leander* experienced a set of 5 miles E.S.E. in 5 hours, when in this vicinity.

Page 267.—**Blunt Rocks** always show above water, consisting of two black masses 1 cable apart. On June 18th, 1894, Capt. Salmond, steamer *Wellington*, reported that when about 1 mile westward of them he passed through a large area of petroleum floating on the sea.

Blunts Reef Lightvessel, established in June, 1905, lies in 27½ fathoms, 4½ miles W.S.W. from Cape Mendocino lighthouse. The vessel is a red steamer, with two masts, each carrying a circular daymark. By night a *fixed bright* light is shown on each mast, elevated 50 ft., and visible 12 miles. In foggy weather, a *Whistle* sounds a blast of 12 *seconds* in every *minute*.

Volcanic Area.—Off Cape Mendocino is an area of submarine volcanic disturbance, the only one known off the Pacific coast of the United States. In July, 1895, when in lat. 40° 13′ N., long. 126° 44½′ W., the ship *Ivanhoe*, Capt. E. D. Griffin, experienced a violent shock lasting 10 to 15 seconds. In November, 1891, he also experienced a similar shock, but less severe, in about the same position. No soundings were obtained. Capt. C. F. Swan also stated that he experienced a similar shock, in 1885 or 1886, when in this locality.

In October, 1894, the schooner *Serena Thayer* was reported to have passed a patch of discoloured water about 3 miles in extent, with strong tide-rips, kelp, and numerous small birds, in lat. 40° 45′ N., long. 127° 32′ W. No bottom was found at 100 fathoms.

On March 1, 1895, when in lat. 40° N., long. 125° 18′ W., the schooner *Volant* was reported to have experienced a violent shock lasting 2 minutes, followed 7 minutes later by a lighter one.

Page 268.—**Eel River** has only 6½ ft. over the bar, which is liable to changes. A *nun buoy*, *black* and *white stripes*, lies westward of the entrance, in 8 fathoms, about 3½ miles S.S.W. of Humboldt or Table Bluff lighthouse.

Pages 268, 270.—**Table Bluff**, 4 miles northward of Eel River, is 165 ft. high, rising to 400 ft. at 2½ miles inland.

The LIGHTHOUSE on Table Bluff is a white wooden tower 30 ft. high, showing a *fixed bright* light, elevated 178 ft., and visible 17 miles. In foggy weather, a *Whistle* sounds *alternate* blasts of 4 *seconds* and 8 *seconds*, with an interval of 24 *seconds* between them. When vessels are known to be in distress, it will sound five or six short blasts, and then a blast of 15 seconds, to summon the lifeboat.

Pages 268-270.—**HUMBOLDT BAY** has been selected as the site of harbour works on this exposed coast. The entrance is now confined between two long partially submerged jetties, 3½ cables apart, extending in a W.N.W. direction from the North and South Spits. Tidal action has scoured the channel, over a width of 250 ft., so that in 1903 there was reported to be a depth of 31 ft. in it at low water.

Buoys.—A *Whistle* buoy, painted *black* and *white stripes*, lies in 15½ fathoms, 1 mile W.N.W. of the entrance, with the old disused lighthouse on the North Spit bearing East, distant nearly 2 miles. About 3 cables E. by N. ¾ N. from the whistle buoy is a *Bell* buoy, painted *black* and *white stripes*, with the disused lighthouse bearing E. ¼ S. A *black spar* buoy lies in 3½ fathoms, about 3 cables north-westward of the submerged end of the North jetty; and a *red spar* buoy in 4 fathoms, about 170 yards N.N.W. from the submerged end of the South jetty. Vessels entering must pass between these two spar buoys.

Lights.—The light and fog signal on North Spit were discontinued on the establishment of the lighthouse on Table Bluff.

On the South jetty, at 1,133 yards within its extremity, is a red pyramidal structure, on which is shown a *fixed red* light, elevated 21 feet. At 680 yards to S.E. by E. of this is a red staff, on which a *fixed bright* light is shown, elevated 32 feet. The lights in line lead to the entrance.

On the inner end of the North jetty, where the channel turns towards North Bay, a *fixed bright* light is shown on a black pyramidal structure.

At 1 cable eastward of the latter light, and on the opposite side of the channel, is a *red buoy*. The tide runs strongly here.

Other small lights are shown farther in.

Vessels waiting for a pilot, or detained by fog, will find good anchorage near the whistle buoy.

Page 270.—The wharf at *Bucksport* extends into a depth of 9 ft. at low water.

Eureka, the principal town on the shores of Humboldt Bay, contains about 8,000 inhabitants, and has railway communication with the interior. Vessels drawing up to 14 ft. can reach the wharves at low water. The exports are chiefly timber, with wool and farm produce.

There are a patent slip and shipbuilding yards on North Spit, timber of the best kind being very plentiful. Australian coal is stored here.

Arcata wharf can be reached by vessels drawing up to 8 ft. at low water.

The climate is temperate, the thermometer varying between extremes of 30° and 70° F.; frost and snow are infrequent. The average annual rainfall is 35 inches. Fog is more or less frequent during the latter part of summer and in autumn, when it sometimes prevails off Humboldt Bay for weeks together.

Page 271.—*Mad River* is now connected with the northern extreme of Humboldt Bay by a canal 10 ft. deep.

Page 271.—**TRINIDAD HEAD Lighthouse.**—In foggy weather a *Bell* is struck by machinery *once* every 10 *seconds*.

Page 273.—**CRESCENT CITY BAY.**—A *Whistle buoy*, painted in *black* and *white stripes*, lies in 18 fathoms, 1 mile S. by W. from Round Rock, and two-thirds of a mile W.S.W. of Chase Ledge.

Page 274.—A *black Bell buoy* lies in about 5¼ fathoms, 60 yards S.E. by E. of *Fauntleroy Rock*. It is liable to drift.

Battery Point wharf has a depth of 10 ft. alongside at low water.

Page 275.—**ST. GEORGE REEFS Lighthouse** is a granite tower, 66 ft. high, standing on *N.W. Seal Rock*, and shows a *flashing* light every 15 *seconds*, *red* and *bright* alternately, elevated 145 ft., and visible 18 miles. In foggy weather, a *Whistle* sounds a blast of 5 *seconds* with intervals of 75 *seconds*. A *red mooring buoy*, for the tender, lies in 27 fathoms, about 3 cables N.E. by N. from the lighthouse.

Page 279.—**OREGON** has an area of 94,560 square miles, and, at the census of 1900, the population numbered 413,536.

Page 280.—**The Coast**, between Smith River and Chetko Cove, consists of low rocky cliffs, fronted by outlying dangers, and inland rocky elevations rise precipitously to heights of 130 to 170 ft. above the cultivated plain.

Chet-ko River.—Miller's House is a large white building, West of the entrance.

Page 281.—**Rogue River** has about 3 ft. water over its shifting bar. A 15-ft. patch lies 2½ miles S.W. by W. of the entrance, and at two-thirds of a mile S.E. ½ E. from this patch is one of 4¾ fathoms, which breaks in bad weather. A *buoy* was moored outside these dangers, but was discontinued in June, 1902.

The coasting steamers use the channel through Rogue River Reefs.

Page 282.—*Island Rock*, 219 ft. high, lies 1¼ mile S.W. of *Mount Humbug*, a conspicuous conical hill 1,740 ft. high.

Page 282.—**FORT ORFORD.**—*Tichenor Rock* is 90 ft. high. At 2½ cables eastward of Battle Rock is a wharf, reaching into 18 ft. at low water.

Pages 283-284.—**Cape Orford** is now known as *Cape Blanco*. In September, 1898, H.M.S. *Leander* experienced a set of 11 miles to S.E., in 7 hours, when in this vicinity.

Page 284.—**ORFORD REEF.**—*Fox Rock*, the S.W. and outer danger, is only 10 ft. high, and lies 5¼ miles S. by W. ½ W. from the lighthouse. A *Whistle buoy* was placed westward of it, but has been withdrawn.

Page 285.—A sunken rock, breaking at very low water, lies about 1¼ mile off shore, 4 miles N. ⅝ W. from the lighthouse.

Page 285.—**COQUILLE RIVER** entrance is being improved by the construction of two jetties, 200 yards apart, and the depth over the bar now varies from 4 to 10 ft. at low water. In 1900, vessels drawing 11 ft. could reach *Bandon* at high water, where there is 13 ft. alongside the wharf at low water. A lifeboat is maintained here. The river can be ascended by small vessels for a distance of 28 miles. Schooners are built here

Numerous rocks embarrass the approach to Coquille River, and they are not all shown on the chart. Sunken rocks extend nearly 1½ mile off shore, southward of the entrance. *Coquille Rock*, which sometimes breaks heavily, lies nearly 2 miles about W. ½ S. from the lighthouse, and the fishermen report not less than 3 fathoms on it. A *conical red buoy* lies in 15 fathoms, about one-third of a mile N.N.W. of the latter rock, and vessels should pass well to westward of it.

The Lighthouse, standing on Rackliff Rock, on the North side of the entrance, is a white tower, 40 ft. high, showing an *occulting bright* light, eclipsed for 2 *seconds* once in every *half-minute*, elevated 52 ft., and visible 12 miles. In foggy weather a *Trumpet* will sound a blast of 5 *seconds* in every *half-minute*.

Cape Arago, the western extreme of the Cape Gregory promontory, is surrounded by numerous rocks.

Page 286.—**CAPE GREGORY,** 2½ miles northward of Cape Arago, is a narrow cliffy projection, about 50 ft. high, off which a rocky ledge extends out to *Baltimore Rock*, of 11 ft., over half a mile N.W. ⅜ W. from the lighthouse.

The Lighthouse is a skeleton tower. In foggy weather, a *Trumpet* sounds *two* blasts of 5 *seconds*, separated by an interval of 8 seconds, in every *minute*.

Pages 286-287.—**COOS BAY** is of increasing commercial importance, the exports being chiefly timber and coal, with farm produce; the mines produce about 100,000 tons of coal annually. A long curved stone jetty has been constructed for a distance of 3,200 yards over the shoals on the North side of the entrance, confining the action of the tide, which has scoured a channel over the bar, varying in depth from 17 to 22 feet at low water. The outer part of the jetty is submerged at low tide.

Buoys.—The buoys, especially the outer ones, are liable to drift. The *Whistle* buoy lies about 1¾ mile N.N.W. from Cape Gregory lighthouse. A *can* buoy, painted *black* and *white stripes*, lies in 8 fathoms, about 2½ cables outside the bar, the lighthouse bearing S. by W. ½ W., distant nearly 1½ mile. A *black can* buoy lies off the submerged extremity of the jetty.

Lights.—On the South side of the entrance, at 4¼ cables E. ¾ S. from Guano Rock,* a *fixed bright* light is shown on a post, at an elevation of 12 ft.; at 7½ cables farther to S. 77° E., is a similar light, elevated 45 feet. These in line lead to the channel over the bar.

At 233 yards within the outer light is a *fixed red* light on a post, and at 237 yards S. by W. ½ W. from this is a *bright* light, elevated 65 ft., and not visible seaward of North. These in line astern lead up the harbour, clear of the buoy marking the submerged jetty off Fossil Point.

Other small leading lights are shown farther in.

Strangers must not attempt to enter without a pilot, who will come off even at night in ordinary weather, with the tug. The least depth at low water is 2¾ fathoms, up to *Empire City*, where wharves have been constructed, and the approaches dredged. Supplies of fresh provisions, water, and wood are plentiful here.

At low water, there is a least depth of 8 ft. up to *Marshfield*.

Page 287.—*Fearless Rock* does not exist in the given position.

Pages 288-289.—**UMPQUA RIVER.**—In 1900, a draught of about 18 ft. could be carried over the bar at low water, and vessels drawing 15 ft. could reach the town of *Gardiner*. Owing to the frequent changes, strangers must not attempt to enter without a pilot, and a powerful steam tug is maintained here.

Buoys.—A *Whistle* buoy, painted in *black* and *white stripes*, lies in 15 fathoms, about 8½ cables outside the bar, with the lighthouse bearing about E. ½ N., distant 1½ mile. A *can* buoy, *black* and *white stripes*, lies in 8½ fathoms, about 2½ cables outside the bar, and is shifted as the channel changes. A *nun* buoy, *black* and *white stripes*, lies in 12 ft., inside the bar, and other buoys mark the channel up the river.

The Lighthouse stands among trees about half a mile inland, on the South side of the entrance, and is a white tower 50 ft. high, showing a *flashing* light, every 5 *seconds*, elevated 165 ft., and visible 19 miles; every *third* flash is *red*, the others being *bright*.

Page 290.—**Siuslaw River** debouches in lat. 44° 0½′ N., and vessels drawing 10 ft. can ascend it for 20 miles. There are salmon canneries and sawmills on its banks. Its shifting bar had only about 6 ft. over it, but the channel is being improved by the construction of two jetties, and, in 1900, the depth had increased to about 8 ft. at low

* On March 22nd, 1905, *Guano Rock* was undermined and overthrown by the sea, the remains only being visible at low tide.

water. A *can buoy, black* and *white stripes*, lies in 9 fathoms, about 2½ cables outside the bar. It is proposed to establish a lighthouse here.

HECETA HEAD Lighthouse, a white tower 50 ft. high, in lat. 44° 8′ N., is built on a ledge excavated in the face of the cliffs, which are from 100 to 200 ft. high; in approaching from the North, only the lantern is visible till abreast it. It shows a *revolving bright* light every *minute*, elevated 210 ft., and visible 21 miles.

Page 290.—**Alseya River** bar had less than 8 ft. over it, and is constantly changing. A *can buoy, black* and *white stripes*, lies in 12 fathoms, about 1 mile outside it.

In 1890, a rocky 8-ft. patch was reported to lie 1¾ mile off shore, abreast *Beaver Creek*. In 1894, Capt. Johnson, of the tug *Robarts*, reported the existence of two sunken dangers, about 1½ mile off shore, at 4¼ and 5½ miles southward of Yaquina River entrance. The sea breaks on them, and with a heavy swell they are visible in the trough of the sea at very low water.

Pages 290-291.—**YAQUINA RIVER** entrance is being improved by the construction of two jetties, and there are now depths of 12 to 15 ft. at low water over the shifting bar. Within this, there is a least depth of 4 fathoms in the channel up to *Newport*, which is in lat. 44° 37½′ N., long. 124° 3½′ W. Up to *Yaquina* the least depth is 16 ft., and to *Oysterville* 13 feet. The channel is marked by buoys and beacons. Yaquina is the terminus of the railway now completed to Corvallis.

Channel Rock, lying in the middle of the entrance, about 4 cables S.W. by S. from the beacon on the extremity of the North jetty, had only 6 ft. water over it, which has been increased to 13 ft. by blasting.

Buoys.—A *Whistle* buoy, painted in *black* and *white stripes*, lies in 15 fathoms, about 4½ miles S. by E. from Yaquina Head lighthouse, and 2 miles south-westward of the entrance between the jetties. About midway between it and the jetties are two more *buoys*, off the South end of the outer reef, and marking the approaches to the entrance.

There are other buoys farther in, which are shifted as the channel changes.

Lights.—Near the inner end of the South jetty is a beacon, on the sands, showing a *fixed bright* light, elevated 15 feet. On *McLean Point*, 7½ cables to N. 48° E., is a white framework structure, on which is shown a *fixed bright* light, elevated 30 feet. These lights in line lead over the bar, and between the jetties, the latter light being shifted to suit changes in the channel.

Other small lights are shown at Newport, etc.

Page 292.—**YAQUINA HEAD Lighthouse** is in lat. 44° 40½′ N.

Page 293.—**CAPE FOULWEATHER.**—The northern extremity is in lat. 44° 50′ N.

Siletz Bay, formerly known as *Nekas River*, is a shallow lagoon, its narrow entrance, with a breaking and shifting bar, being in lat. 44° 55½′ N. A *nun buoy, black* and *white stripes*, lies about three-quarters of a mile S.W. by W. from the entrance.

Salmon or *Nechesne River* runs into an inlet southward of Cascade Head, and has some remarkable rocks off it.

Nestuggah Bay, 6 miles northward of Cascade Head, is a shallow inlet, with some streams running into it. A *can buoy, black* and *white stripes*, lies in 11 fathoms, about half a mile westward of the bar. Breakers have been seen, and a depth of 5 fathoms reported, on *Doig Ledge*, at 2½ miles S.S.W. of Haystack Rock.

Cape Kiwanda, or *Haystack Point*, is of a yellowish colour, and nearly half a mile S.S.W. of it is *Haystack Rock*, 327 ft. high, a conspicuous landmark. There is said to be anchorage in 6 fathoms, South of it. *Nawuggah River* appears to have closed up, or may be identical with the shallow *Sand Lake*, the entrance of which is 3½ miles northward of Cape Kiwanda.

Page 294.—**CAPE LOOKOUT** is in lat. 45° 20⅓′ N., long. 124° 0½′ W., its extremity being 432 ft. high. In heavy N.W. weather, the local trading steamers find shelter under its lee.

CAPE MEARES Lighthouse is a white tower 23 ft. high, showing a *fixed bright* light, varied by a *red flash* every *minute*, elevated 223 ft., and visible 21 miles.

A rock, 76 ft. high, lies 3 cables N.W. of the lighthouse, and another, 109 ft. high, nearly 4 cables farther on. *Arched Rocks* are from 250 to 304 ft. high.

Pages 294-295.—**TILLAMOOK BAY** now has several settlements on its shores, the principal named *Garibaldi*, and the river has been improved by dredging and embanking, so that vessels drawing up to 9 ft. can reach *Tillamook City* at high water. The shifting bar has about 10 ft. over it at low water, and a *Whistle buoy, black* and *white stripes*, lies in 14 fathoms, half a mile outside it, with the signal staff on Green Hill bearing E. ½ N., distant 2 miles.

Page 295.—**Nehalem River.**—Coal exists here, and steps are now being taken to mine it. A *can buoy, black* and *white stripes*, lies in 13 fathoms, about 1 mile outside the shifting bar.

Page 295.—**Cape Falcon** is in lat. 45° 46′ N., long. 123° 59½′ W., its extremity being 350 ft. high.

Page 296.—*Ne-ah-kah-nie* is 1,710 ft. high.

At 2¼ miles northward of Cape Falcon, and 8 cables off shore, is a rock 113 ft. high, at 4 cables S.W. by S. ½ S. from which is a rock awash. Another reef, visible at low water, lies 1 mile off shore, abreast *Double Peak* 1,050 ft. high, 5 miles northward of Cape Falcon.

TILLAMOOK HEAD is in lat. 45° 56½′ N. *Tillamook Rock* was reduced in height to 90 ft. by blasting, when the lighthouse was built.

Saddle Mountain, 14 miles N.E. by E. ¼ E. from Tillamook Head, is 3,300 ft. high, forming a good landmark in clear weather.

Pages 297-304.—**COLUMBIA RIVER** is now navigable by large sea-going vessels as far as the Cascades, about 105 miles above its entrance (see Addenda for page 310), the channel having been much improved by dredging and embanking. In 1905, vessels drawing up to 24 ft. could reach Portland at high water, though in several places there was still a depth of only 20 ft. at low water; dredging is actively going on, to attain a minimum depth of 25 ft. at low water.

The dangerous character of its notorious bar has been considerably ameliorated by the construction of a stone jetty or breakwater, extending no less than 4¼ miles over Clatsop Spit from Point Adams, in a westerly direction. This was completed in 1895, and caused a straight channel, half a mile wide, to be scoured over the bar, with a depth of 31 ft. at low water. Unfortunately, this silted up to 20 ft. in January, 1904, but works are now in progress to extend the jetty 2½ miles farther out, which it is thought will increase the depth to 40 feet. In November, 1904, the jetty had been extended about 1¼ mile, and the depth in the channel over the bar had increased to 24 ft. at lowest tide. Should this not prove permanently successful, another jetty will be constructed from the North bank of the river, to a distance of 2½ miles. Up to 1905, about £750,000 had been expended over the works, and it is estimated that £450,000 more will be needed to complete them.

In winter, this coast is most dangerous, especially in December and January, when fearful storms sometimes occur. The currents also are strong and irregular, and have been the cause of many casualties. In winter, after a long continuance of southerly winds, it runs as much as 3 miles an hour northward, near the coast. In summer, a southerly set prevails. In thick weather, or at night, a proper and constant use of the lead is necessary in approaching.

Pilotage is compulsory for vessels crossing the bar. In ordinary weather, the pilot schooner cruises at sea, near the lightvessel, or between North Head and Tillamook Bay. The present rate is 5 dollars per foot of draught, and 2 cents per registered ton. From Astoria to Portland, there is an additional charge of 2 dollars and 2 cents, respectively. In winter, vessels have often had to wait days together for pilots or tugs to come out.

Lifeboats are stationed at Point Adams and Cape Disappointment.

Directions.—In winter, when S.E. and S.W. winds prevail, sailing vessels must endeavour to make the land well to the southward of the river entrance, and to be careful not to get northward of its parallel, or there may be much loss of time in beating back. In fine weather, vessels of moderate draught can easily cross the bar, with ordinary precaution, but in bad weather strangers should not attempt it.*

The Rule of the Road for Inland Waters (see the Addenda for pp. 204-206) is in force in the Columbia River, eastward of a line joining Cape Hancock lighthouse with the old lighthouse tower on Point Adams.

Page 300.—**COLUMBIA RIVER Lightvessel** lies in 36 fathoms, 7⅞ miles S. 27° W. from Cape Hancock lighthouse; it is painted red, with two masts having a ball on each, and a funnel between. It exhibits *two fixed bright* lights, one on each mast, at an elevation of 30 ft., and visible 10 miles. In foggy weather, a *Whistle* sounds a blast of 5 *seconds* in every *minute*. The vessel is liable to drift. On calm days, on the ebb, fresh river water can sometimes here be dipped from the surface.

POINT ADAMS Light is discontinued, but the tower remains as a mark.

Page 301.—**CAPE DISAPPOINTMENT NORTH HEAD Lighthouse** is a white

* Capt. J. Tadsen, of the German ship *Wandsbek*, states (in "Der Pilote," Heft xix, 1904) that from December 14, 1903, to January 13, 1904, no outward-bound sailing vessel was able to cross the bar, owing to the heavy sea.

tower 50 ft. high, showing a *fixed bright* light, elevated 192 ft., and visible 20 miles, but to northward it is not visible eastward of the bearing N. by W. $\frac{7}{8}$ W.

CAPE HANCOCK Light, $1\frac{3}{4}$ mile S. 61° E. from North Head lighthouse, is now *revolving*, 15 *seconds*, the flashes being alternately *red* and *bright*.

A *Signal Station* is established near North Head lighthouse, with facilities for receiving or signalling telegraphic messages. Weather signals are also exhibited.

Pages 302-304.—**The Entrance,** by the construction of the jetty over Clatsop Spit, is reduced to $2\frac{1}{2}$ miles in width. In consequence of the scour thus caused, *Middle Bank* has disappeared, and there is a direct channel over the bar. Owing to the constant changes in the shoals on either side, no permanent description of them can be given.

The Buoyage is arranged on the *Uniform System*, *black can* buoys to port, and *red nun* buoys to starboard, in entering. They are shifted as necessary, to meet the constant changes in the channel.

In 1905, on the North side of the entrance there was a *Whistle* buoy, *black* and *white stripes*, lying in 17 fathoms, 5 miles S. by W. $\frac{1}{4}$ W. from North Head lighthouse. The *Outer buoy*, a *black* and *white striped can*, marking the entrance to the channel, was in $8\frac{2}{3}$ fathoms, with North Head lighthouse bearing N. $\frac{3}{4}$ E., and Cape Disappointment lighthouse N.E. $\frac{7}{8}$ N.

Page 303.—*Mount St. Helen's*, an extinct volcano, is now considered to be 8,608 ft. high.

Page 304.—**Baker Bay** has depths of 2 to 3 fathoms in its western part, but the rest of it is very shallow. The deepest approach is westward of Sand Island. In its N.W. part is the village of *Ilwaco*, connected by railway with Willapa Bay; vessels drawing 8 ft. can reach the wharf at half-tide, and lie afloat at low water.

Page 305.—*Chinook Point* is fortified.

At 3 miles N.E. by N. from Point Ellice is *Knappton*, the *Quarantine Station*, fitted with every requisite for disinfecting vessels, etc.; the wharf has a depth of 25 ft. alongside at low water.

Clatsop Channel is now $1\frac{1}{2}$ mile in width, with depths of $5\frac{1}{2}$ to 8 fathoms, between Sand Island and Clatsop Spit, but the navigable channel becomes very narrow at Desdemona Sands.

Desdemona Sands Lighthouse stands on the western extremity of the bank, in a depth of 2 fathoms, at $10\frac{1}{2}$ cables N. 31° W. from Fort Stevens wharf. It is an octagonal white pile structure, showing a *fixed bright* light, elevated 46 ft., and visible 12 miles. In foggy weather, a *Trumpet* sounds *two* blasts of 2 *seconds* in every *half-minute*:—blast, silent 3 seconds, blast, then silent 23 seconds.

Numerous small leading *lights* are shown between this and Portland.

Page 306.—**ASTORIA** contained 8,381 inhabitants at the census in 1900, and is now connected with the railway system. Vessels must enter at the customhouse here, before proceeding to Portland. Its projecting wharves narrow the navigable channel to about 300 yards, and vessels of any size can lie alongside them. Its trade is now chiefly carried on by the railway; in 1903, the exports by sea were valued at only £7,964, chiefly coal and tin. The vessels entering numbered 901, with a tonnage of 945,761. It has a good supply of fresh water. A patent slip can raise weights up to 1,200 tons.

The anchorage off the town is reported to be inferior, the holding ground not being good. The best anchorage will be found 2 or 3 miles below the town.

In 1904, the total pack of tinned Columbia River salmon was only 420,798 cases (of 48 lbs.), much of the fish now being sent away in a pickled or frozen state. The principal fishing season is from April to July, when upwards of 1,000 boats may be fishing, some as far out as the bar. Their catch is landed at the numerous wharves between Astoria and Tongue Point.

Page 307.—**Tides.**—Should a vessel be unprovided with a local tide table, the time of high water, at Cape Disappointment, may be found by adding the times given below to the time of the moon passing the upper meridian, as given in the Nautical Almanack. At its greatest northerly declination, 12h. 4m., rise 8 ft.; at 0°, 11h. 43m., rise $7\frac{1}{4}$ feet; and at its greatest southerly declination, 13h. 18m., rise 6 feet.

Page 308.—**Columbia River,** between Astoria and Portland, cannot be navigated by strangers without the aid of a pilot, the channel being very narrow and winding in many parts, especially as Portland is approached, where it passes between high and wooded rocky banks.

Page 309.—**PORTLAND** contained 90,426 inhabitants at the census in 1900, now estimated at 130,000, and is of increasing commercial importance. In 1904 the vessels entering numbered 405, with a tonnage of 400,240; the exports, chiefly wheat and flour, were valued at £1,422,786, and the imports at £1,167,282. There are shipbuilding and repairing works here, and a patent slip can raise weights up to 700 tons. In 1904 a large sectional pontoon dock was established here, 468 ft. long, 82 ft. wide, with 25 feet over the blocks, capable of raising vessels up to 500 ft. in length, and weights up to 10,000 tons. The dry dock works had to be abandoned, the foundation being faulty. The city has a plentiful supply of good water, but provisions, stores, and labour are stated to be dear. Coal can usually be obtained here, but, in 1901, it was scarce, the river steamers burning wood. There is a Seamen's Institute, and hospital accommodation.

In May and June, the Willamette is always in flood, owing to the level of the Columbia being then raised by the snow melting in the interior. In 1894, the water reached a level 34 ft. above low-water mark at Portland, causing great damage.

Page 310.—As stated in the Addenda for pages 297-304, the navigation of the Willamette has been much improved by dredging and embanking, so that vessels drawing up to 24 ft. can reach Portland at high water, when the river is at its lowest level.

Page 310.—**The Cascades** are about 15 miles above Vancouver. The lock and canal around them were completed in 1896, at a cost of over £700,000, the lock being 521 ft. long, by 90 ft. wide, with a lift of 24 feet. In 1893, the river below the Cascades rose to the extraordinary height of 80 ft. above the low-water level, the usual flood rise being 20 feet.

The *Dalles* can now be reached by river steamers drawing up to 8 ft., and works are shortly to be commenced to construct a canal, about 12 miles in length (to cost about £825,000), to carry them round the rapids, and so open upwards of 500 miles of river navigation.

Mount Hood is 11,758 ft. high.

Page 311.—**WASHINGTON** was admitted into the Union as a *State* in 1889, Olympia being the capital, though Tacoma is by far the more important city. At the census in 1900, the population numbered 518,103. In 1904, the output of coal was estimated at 2,801,501 tons (of 2,000 lbs.); and the pack of tinned salmon amounted to 345,223 cases (of 48 lbs.), 291,273 of which were in the Puget Sound district, or only about one-quarter of that of 1901, the largest on record.

Pages 312-315.—**WILLAPA BAY,** formerly known as *Shoalwater Bay*, is of increasing commercial importance, owing to the growth of the population on its shores. Large quantities of excellent timber are shipped here in small vessels, and 33,800 cases of tinned salmon were packed in 1901. *Bruceport*, or *South Bend*, on the South side of the entrance of Willapa River, is connected with the railway system. On the east side of the southern peninsula is *Sealand*, connected by railway with Ilwaco, in Baker Bay, Columbia River. Another line runs from Cape Shoalwater to the head of Grays Harbour.

Pilots usually cruise off the entrance, and a steam-tug is available. A *lifeboat* is stationed on the western beach, about 2 miles southward of Sealand.

The low sandy extremities of Leadbetter Point and Cape Shoalwater, once 5½ miles apart, at latest accounts were only 2½ miles apart, and are liable to constant changes. The banks forming the bar extend about 3½ miles seaward, their western part being steep-to. The bar channel is liable to shift its position, and to changes in depth; in 1897, it had a least depth of 19 ft. at low water. The tide rises 8 ft. at springs. The outer buoys frequently have to be shifted to correspond with the changes.

In October, 1905, a *Whistle buoy*, *black* and *white stripes*, was placed in 17 fathoms, outside the North channel over the bar, with the lighthouse bearing N.E. Within this is the *Outer buoy*, *can*, *black* and *white stripes*, lying in 8 fathoms, on the outer edge of the bar. Within these outer buoys, the frequented channels in Willapa Bay are marked by buoys, etc., arranged on the *Uniform System* (see the Addenda for pages 204-206.)

Within the bar the main channel deepens to 10 and 14 fathoms, and then shoalens. At low water, there is a least depth of 15 ft. up to *South Bend*, the approaches having been improved by dredging and embanking; a least depth of 13 ft. is found for some distance up the *Willapa or Wallahpah River*. Vessels drawing 22 to 25 ft. can reach South Bend, and lie afloat at low water. Fresh provisions and water can be obtained here, and adjacent is a beach where vessels can safely be beached for cleaning, etc.

Pages 315-317.—**GRAYS HARBOUR** is increasing its commerce, which chiefly consists in the export of timber, with considerable quantities of salmon. In 1901,

the salmon tinned amounted to 41,500 cases (of 48 lbs.). Its chief towns and villages are now connected with the railway system. Attempts are being made to improve and deepen its shifting bar by the construction of a jetty, commenced in 1898, extending seaward from Chehalis Point. It is now about 4,600 yards in length, and it is ultimately intended to be 3½ miles long. In 1905, there was a least depth of 15½ ft. in the channel over the bar, at low water, and this is expected to increase to 24 ft. on the completion of the breakwater.

The bar is marked by *buoys*, which are shifted as the channels may alter. The various channels within the bay are marked by buoys, beacons, and small lights, which it is quite unnecessary to describe, as no stranger should attempt to enter without a pilot. Within the bar, the water deepens in the fairway, and a depth of at least 19 ft. will be found at low water up to Grays Harbour and Westport wharves.

CHEHALIS POINT LIGHTHOUSE, standing near Westport, at 1½ mile within its northern extreme, is a white octagonal tower, about 100 ft. high, showing a *flashing* light, every 5 *seconds*, alternately *red* and *bright*, elevated 119 ft., and visible 17 miles. In foggy weather, a *Siren* sounds *two* blasts of 5 *seconds* every 1½ *minute*:—a blast, silent 5 seconds, blast, then silent 75 seconds.

A *lifeboat* is stationed near the lighthouse.

The directions formerly in use for crossing the bar are now worse than useless. In approaching from sea, the land is low and wooded on either side, and the only available landmark is *Saddle Hill*, rising over the northern side of the bay to an elevation of about 400 ft., at 2 miles from the coast.

The entrance is now about 1⅔ mile in width, between Chehalis and Brown Points, but the navigable channel is narrowed to about 3 cables, by the shallow bank extending over 1 mile from the latter. The banks forming the bar reach 3½ miles seaward, and the buoys are often shifted to suit changes in the channel.

Outer Buoys.—A Whistle buoy, red, lies in 15½ fathoms, about 1¼ mile outside the bar, with the lighthouse bearing E. ⅝ N., in 1904. *Outside Bar buoy, can, black* and *white stripes*, was in 7 fathoms, with the lighthouse bearing E. ⅛ N. *South Channel Outer buoy, nun, black* and *white stripes*, was placed in December, 1904, in 7½ fathoms, with the lighthouse bearing E. by N., to mark the entrance of the new South channel over the bar, which is very narrow, and passes close to the jetty.

A least depth of 6 ft. at low water will be found in the channel up to the sawmills at *Laidlaw*, 2 miles southward of Westport wharf; and 11 ft. to the railway wharf at *Ocosta*, 1½ mile north-eastward of Westport.

Page 317.—The area of Grays Harbour is estimated at 97 square miles, two-thirds of it being dry at low water.

There is a least depth of 11 ft. to *Hoquiam*, and the channel is being improved.

Chehalis River has been improved by dredging, etc., and a depth of 18 ft. may be carried up to *Montesano*, a distance of about 15 miles.

Page 318.—**Point Grenville** has cliffs over 100 ft. high. *Arch Rock* is 84 ft. high, and a rock awash lies 2 cables W.N.W. of it. *Sonora Reef*, 1½ mile W.N.W. of Arch Rock, is reported to extend continuously thence to *Cape Elizabeth*, 3¾ miles N.W. by W. ¾ W. from Point Grenville, some parts drying at low water.

Pages 318-319, 320.—The *Queniutl Indians* are now under Government control, and always ready and anxious to render all the aid they can to rescue and assist those who may be unfortunate enough to be cast away on their shores. The currents on this coast appear to be uncertain, the wreck and loss of the ship *Port Gordon*, in 1888, being attributed to a strong southerly current, whereas competent authorities have reported a set in the opposite direction.

Page 319.—**DESTRUCTION ISLAND Lighthouse,** on the S.W. end, is a white iron tower, 80 ft. high, showing a *flashing bright* light every 10 *seconds*, elevated 144 feet, and visible 18 miles. In foggy weather, a *Siren* sounds a blast of 5 *seconds* in every *minute*.

Page 320.—**Cape Alava,** 13 miles southward of Cape Flattery, is a grassy bluff, fronted by *Flattery Rocks*, and at 2½ miles West of it lies the outer part of the dangerous *Umatilla Reef*. *Ozette Islet*, the largest of the group, is 240 ft. high.

Umatilla Reef Lightvessel, a red steamer, with two masts, lies in 25 fathoms, about 2½ miles S.W. ⅝ S. from the reef, and shows *two fixed bright* lights, one on each mast, elevated 39 ft., and visible 11 miles. In foggy weather, a *Whistle* sounds a blast of 3 *seconds* in every *half-minute*. The vessel is liable to break adrift, being in such an exposed position, and may at times be withdrawn for refit, the station then being marked by a buoy.

Indians.—See the Addenda for pages 318-319.

Page 321.—**JUAN de FUCA STRAIT** can easily be navigated, with ordinary precautions, without the aid of a pilot; and, in winter, vessels arriving here may fail to find pilots or tugs near the entrance. Pilotage is only compulsory within the limits of the ports. Persons acquainted with the navigation of the inner channels may be engaged at Neëah Bay; and, from January to July, such a person might be had from one of the sealing vessels off the West coast of Vancouver Island.

At times, the pilot schooners of the various ports cruise outside Race Islands, and should a pilot be taken from them for Royal Roads, his charge will vary from 6 dollars per foot of draught from Cape Flattery, to 75 cents if from within Race Islands. From Cape Flattery to Fraser River or Burrard Inlet, the charge for sailing vessels would vary from 6 dollars per foot from Cape Flattery, to 3 dollars if from within Race Islands, steamers or vessels in tow being charged half these rates.

Steam-tugs are stationed at Port Townsend, and their services are procurable at or below a fixed tariff of rates.

Vessels bound to ports in British Columbia must first be inspected at the quarantine station at William Head, Parry Bay; and those to ports in Washington, at the quarantine station near Port Townsend.

Rescue Stations, with depôts of provisions, and other necessaries, have been established at the Cape Beale and Carmanah lighthouses, for the benefit of persons wrecked on the coast. Notice boards have been erected along the coast between Cape Beale and Port San Juan, giving information necessary for those in distress. As wrecks do not usually break up rapidly on this coast, seamen are advised to stay by the ship as long as possible, the loss of life on these occasions being mainly owing to attempts to get ashore, or from exposure afterwards.

Page 322.—Rocky shoals and dangers are usually marked by kelp during the summer and autumn, and vessels should keep clear of it. In winter and spring it is not always visible.

Pages 322, 390, 405.—**Tides and Currents.**—Off the entrance to Juan de Fuca Strait, the tidal stream normally sets about East at high water; passing through South to West at low water; and then through North to East again. With a strong ebb, it sets between S.W. by S. and W. by S. from about 2h. after to 4h. before high water, then gradually changing through West, and running N.N.W. at high water. It remains nearly slack for 2 hours, then changing quickly through East to South and westward. The ebb runs much faster than the flood.

Farther investigation shows that the flood stream flows northward past Cape Flattery, and then divides, one part continuing to flow northward, and the other part setting diagonally across the Strait on to the Vancouver coast, as far as Race Islands. With southerly winds, which prevail in winter, its velocity is increased, and vessels must then take every precaution to avoid being drifted on to the dangerous rockbound coast of Vancouver. Many wrecks have occurred from this cause, especially in the vicinity of Cape Carmanah. At spring tides it runs 3 or 4 knots an hour, but near Race Islands, Beechey Head, and other projections, its velocity increases to from 5 to 7 knots.

The ebb tide divides into two branches between Cape Flattery and the Vancouver shore, one turning sharply to the southward around the cape, and the other sets to the westward along the Vancouver Island shore. The flood sets invariably to the northward into all the sounds running into the Vancouver coast.

Off Juan de Fuca Strait, and along the western coast of Vancouver Island, the surface current appears to depend to some extent upon the force and direction of the wind. In winter, the prevailing winds being between S.E. and S.W., the tendency is to produce a northerly set, and numerous instances have occurred of such a set.

In the offing, the surface current is usually described as always setting southward; but Capt. C. E. Clarke, Harbour Master at Victoria, in 1901, writes that from his experience there is a constant set to the N.W., 40 or 50 miles in breadth, increased in velocity by the ebb setting W.N.W. out of the Strait. He, therefore, advises sailing vessels arriving here in the winter, especially in November and December, and meeting with easterly or S.E. winds (which then prevail), not to pass northward of the parallel of Cape Flattery, till circumstances will allow them to enter the Strait.

In July, 1901, H.M.S. *Egeria*, when at anchor occasionally on Swiftsure Bank, found the general set to be in a westerly direction, from North to South.

Near the coast, the direction of the surface current depends mainly on the tide and prevailing winds, being irregular, and rarely exceeds 1 knot in velocity.

Recent observations, by means of tide-guages, at several places in the *Straits of Juan de Fuca* and *Georgia*, show there are two high waters and two low waters of

unequal heights and times in the lunar day, the diurnal inequality being greatest in *low water heights* and in *high water times*. The higher high water rises to almost the same height every day; and, as the height of the lower low water (through the large inequality) depends almost entirely upon the position of the moon in declination, it will be seen that spring and neap tides, as commonly understood, do not exist.

The lunitidal intervals of all tides being largely affected by inequality, which also varies with the moon's declination, there can also be no "establishment" as generally understood; and there is, besides, a large and varying difference between the lunitidal intervals of the tides following the superior and inferior transits of the moon on any given day.

Tables have been published by the U.S. and Canadian authorities, giving the approximate times and heights of the tide for the various parts of this region; but it should be remembered that they will be much influenced by barometric changes and gales, especially by those from the S.E., which may raise the level by 2 ft., and delay the tide by half an hour.

Pages 323, 405.—**Soundings.**—In June, 1897, a sounding of 26 fathoms, very coarse sand, was reported from the steamer *Mogul*, when in lat. 48° 46′ N., long. 126° 36′ W., outside the 100-fathoms line as shown on the chart. Another quick cast showed no bottom at 98 fathoms.

Swiftsure Bank.—A 13-fathoms bank is said to lie about 14¾ miles N.W. by W. ¾ W. from Cape Flattery lighthouse. In 1889, H.M.S. *Swiftsure* found 20 to 30 fathoms hereabout, and, in 1901, H.M.S. *Egeria* found depths of 20 to 25 fathoms on it.

Pages 324, 392.—**Fog.**—Observations taken during 7 years, 1886-1892, show that from November to June there is not much fog in the Strait, April being the clearest month. July, August, and September, are the foggiest months, the average for these at Cape Flattery being 119, 183, and 120 hours respectively; at Ediz Hook, 80, 86, and 65 hours; at Dungeness, 69, 88, and 77 hours; and at Wilson Point, 48, 65, and 82 hours.

Magnetic Variation.—In 1889, Mr. Cumming Dewar, of the yacht *Nyanza*, reported that when about 5 miles from the Vancouver Island shore, between the River Jordan and Beechey Head, the compasses were powerfully affected by some local attraction, which disappeared as the vessel was kept more over towards the mainland.

Recent information shows that the magnetic variation, between Vancouver Island and the mainland of British Columbia, is also changing much more rapidly than was previously supposed. In 1897, at Vancouver Harbour there appeared to have been an increase of about 1° 35′ since 1891. At Baynes Sound, the chart showed the variation as about 23½° E., but observations showed it to be more than 26°. Similar results have also been obtained in other localities, and mariners are advised to bear this in mind, when navigating in these waters.

Page 326.—**CAPE FLATTERY Light** now shows a *red* sector over Duncan and Duntze Rocks, between N. 39° W. and N. 32° W. It is obscured eastward, between N. 73° E. and S. 15° E., but eastward of Chibadehl Rocks it is not visible till it bears southward of S. 68° W. *Storm Signals* are exhibited at a white building 400 feet S.E. of the lighthouse; the *Signal Station* is removed to Neéah Bay. A *white mooring buoy*, for the lighthouse tender, lies about 3 cables N.N.E. of the lighthouse.

Vessels are recommended not to pass between Tatouch Island and Duncan Rock, as breakers have been seen about 1½ cable S.E. and eastward of the latter. In 1893, a 4-fathoms shoal was reported to lie 7¾ cables N. by W. ⅞ W. from the lighthouse.

Pages 326-327.—**NEE'AH BAY** is sheltered from winds between N.E. and W. by S., but should be left on any indication of a N.W. (not N.E.) wind. The bottom is hard sand, and vessels should not go into less than 5 fathoms. During S.W. or westerly gales, sailing vessels usually lie-to under the coast, eastward of the bay, in preference to anchoring in it. A *red Whistle buoy* lies in the entrance, in about 22 fathoms, 4 cables N.W. of the North end of Waaddah Island.

Waaddah Island is about 240 ft. high. A *bright* lantern *light*, elevated 20 ft., is shown on a white post on the N.W. extremity.

There is a *Signal Station* on *Baaddah Point*, with telegraphic communication, for reporting vessels, etc., and storm signals are exhibited. A small *fixed bright light*, elevated 16 ft., is shown on a post on the point.

Page 327.—**Clallam (Callam) Bay Light.**—On *Slip Point* stands a white framework structure, on which is shown a *fixed bright* light, elevated 30 feet. In foggy weather, a *Trumpet* sounds a blast of 2 *seconds* in every 20 *seconds*.

Page 328.—**Gettysburg** is a village at the entrance of *Lyre River*. A small *fixed bright light* is shown on *Low Point*.

Crescent Bay.—A small *fixed red light* is shown on the western point. The off-lying sunken rock is marked by a *conical red buoy*. A telegraph cable from Becher Bay, Vancouver Island, is landed here.

Page 328.—**Ediz Hook.**—A *telegraph cable* from Albert Head, Vancouver Island, is landed at 1½ mile westward of Ediz Hook lighthouse, and vessels are cautioned against attempting to anchor in its locality.

Pages 328-329.—**PORT ANGELES.**—The town is on the southern shore, the wharves having depths up to 22 ft. alongside. Storm signals are shown here. In foggy weather, a *Bell* is sounded in a white tower, 108 yards N.W. by N. from *Ediz Hook* lighthouse, being struck by machinery *once* every 15 *seconds*.

Pages 329-330.—**NEW DUNGENESS BAY.**—The usual anchorage is in 8 to 10 fathoms, with the lighthouse bearing N. ½ W. (*N. by E. ½ E. true*); it is safe, even with S.E. winds, the bottom being tenacious mud. A *red nun buoy* lies in 4½ fathoms, at the extremity of the shoal extending from the spit.

Pages 330-331.—**PORT DISCOVERY.**—Vessels bound here in ballast, to load timber, need not first proceed to Port Townsend; customs and other officials will come thence by the railway. The *Quarantine Station*, provided with every recent appliance for disinfecting vessels, etc., is on Clallum Point.

Page 331.—**Protection Island** is inhabited and partly cultivated. A *black buoy* lies on the shoal extending westward from its S.W. end.

Page 331.—**Libby Rock,** with 11 ft. over it, lies about half a mile off Middle Point, and 3½ miles W.S.W. of Wilson Point lighthouse; a *red nun buoy* lies northward of it, in 8 fathoms.

Page 331.—**WILSON POINT Light** is now *fixed bright*, varied by a *red flash* every 20 *seconds*. The point is strongly fortified. A *red nun buoy* lies in 7 fathoms, off the foul ground N.W. of the point, with the point bearing E. by S. ⅝ S, distant 7½ cables. A *red spar buoy* lies in 5 fathoms, off Point Hudson, 1½ mile S.E. ¾ S. from the lighthouse.

Page 332.—**PORT TOWNSEND** now contains about 5,000 inhabitants, and the town has extended out to Hudson Point. It carries on a considerable trade in the export of timber, and large salmon canneries and fish-preserving works have been established. In 1904, the exports were valued at £418,027. The wharfage accommodation has been increased, and vessels can lie alongside in deep water. Pilotage is optional, and powerful steam-tugs are available. It is not yet connected with the railway system, but a line has been constructed, passing along the S.E. shore of Port Discovery, to Quilcene Bay, on the northern branch of Hood's Canal.

Stores, fresh provisions, water, and coal can be obtained here, and there is a well appointed hospital. There are shipbuilding yards, where ordinary repairs can be executed for wooden or iron vessels and their machinery. There are facilities for rating chronometers at the customhouse.* The ironworks at Irondale, southward of the fort, have been enlarged and improved.

In 1903, the vessels entering the ports of Puget Sound numbered 2,042, with a tonnage of 1,337,484. The exports to foreign countries were valued at £5,355,453, and the imports at £1,721,697.

To avoid the risk of damage to submarine cables, anchorage is prohibited within the area 4 cables south-eastward of a line drawn in a N. 43° E. direction from Wilson Point lighthouse to the shore about 2½ cables northward of Admiralty Head lighthouse; within a similar area westward of a line N. 17° W. from Marrowstone Point light to the shore southward of Admiralty Head lighthouse; and within a similar area north-eastward of a line S. 77° E. from a point 6¼ cables S. 5° W. from Wilson Point lighthouse to the shore 3¾ cables westward of Marrowstone Point light.

In March, 1898, the steamer *Victoria*, drawing 18 to 21 ft., struck heavily on some obstruction among the kelp, at about 3½ cables S.E. ⅝ E. from the customhouse.

Lights.—A small *fixed red* lantern light is shown on *Hudson Point*; and another, elevated 22 ft., on *Marrowstone Point*. At the latter a *Bell* is sounded in foggy weather, *one* blow every 15 *seconds*.

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* *Mount Baker* (described on page 344) bears *N.* 43° 5′ 7″ *E* (*true*) from the centre of the customhouse at Port Townsend, and forms an excellent mark for testing the compasses of vessels lying here.

Marrowstone Point and Admiralty Head are now strongly fortified.

Page 333.—**ADMIRALTY HEAD Lighthouse** has been moved 3½ cables N.W. ¼ W., to a position on *Red Bluff*. It is now a round brick tower, about 40 ft. high, coloured white, and the *fixed bright* light is elevated 127 ft., and visible 17 miles. It is in lat. 48° 9′ 40″ N., long. 122° 40′ 46″ W.

Page 333.—**PUGET SOUND, &c.**—Reliable pilots may be obtained for the navigation of these waters, but at present pilotage is not compulsory. Strangers are recommended to employ one.

Bush Point is marked by a small *fixed bright light*, elevated 25 feet.

Page 334.—**Point No Point.**—The *Fog Signal* is now a *Trumpet*, sounding *two* blasts of 3 *seconds* every *half-minute*:—blast, silent 3 seconds, blast, silent 21 seconds.

Page 335.—**Port Madison.**—A small *fixed red light*, elevated 25 ft., is shown on *Monroe Point*, at 150 yards from the end of the spit, on the S.E. side of the entrance.

Duwamish Bay.—A small *fixed bright light*, elevated 12 ft., is shown on *Alki* or *Battery Point*. A *red Bell buoy* lies in 6 fathoms, close off the spit extending N.N.W. of *Duwamish Head*.

Pages 335-336.—**West Point Lighthouse** has a black lantern, and the light is elevated 27 feet. The *Fog Signal* is now a *Trumpet*, sounding a blast of 5 *seconds* in every *half-minute*.

Page 336.—**SEATTLE** had 80,671 inhabitants, at the census in 1900, now estimated at 150,000, and is the largest and most thriving town of this region, being connected with the Canadian and United States main railways, and having lines of steamers to Alaska, Hawaii, Japan, &c. It is also the headquarters of the Puget Sound fisheries. There are shipbuilding and engineering works, where ordinary repairs can be executed; also a steel foundry and several large sawmills. The patent slip cradle is 200 ft. long, and will take a weight of 1,000 tons; there is a pontoon dock 190 ft. long, and 55 ft. wide inside, for weights up to 2,500 tons. The wharves have depths of 40 to 45 ft. alongside, and the head of the bay is being deepened and improved by dredging. Bituminous and lignite coal is stored in large quantities, and is supplied at a moderate price. The exports are chiefly wheat, flour, tinned salmon, and timber, valued at £1,585,590 in 1904; the imports were valued at £453,656. Stores, fresh provisions, and water can be obtained here. Powerful steamtugs are always in readiness.

Ballard.—Eastward of Seattle is the large inland sheet of water known as *Lake Washington*. It is proposed to connect this with Puget Sound by a ship canal from Salmon or Shilshole Bay, viâ *Lake Union*. At present a canal, with 10 ft. in it at low water, has been dredged to the wharves at *Ballard*, where there are large sawmills. Capt. H. Engel, of the German vessel *Osorno* (*Der Pilote*, Heft 20, 1904), states that vessels loading here lie in 15 to 18 fathoms, good holding ground, off the entrance to the canal, and the timber is brought off in large lighters, and hoisted on board by a floating steam-crane. In foggy weather, vessels lying here should make regular fog-signals, to avoid other vessels colliding with them. Wooden vessels are built here.

Port Blakely is frequented by vessels shipping timber from the great sawmill here. The anchorage is landlocked, and vessels have here been safely beached for cleaning, etc.

Eagle Harbour, about 1½ mile northward of Port Blakely, has an entrance scarcely half a mile wide. Capt. Engel, of the *Osorno*, states that it is much used by vessels undergoing repairs or for wintering, being quite landlocked and secure. A large pontoon dock was to be stationed here, capable of raising vessels of over 3,000 tons.

Can buoys have been placed in the entrance of Eagle Harbour, a *red* one near the S.E. extremity of Wing Point reef, forming the northern side of the entrance, and two *black* ones off the spit on the South side of the entrance. A *striped* can buoy lies in 3½ fathoms, about 183 yards to the S.S.W. of *Tybee Shoal*.

Restoration Point.—*Decatur Reef*, extending off Restoration Point, is marked by a *red spar buoy*, in 8 fathoms, on its eastern side, 2 cables E. by S. ½ S. from the point.

Page 337.—**Rich Passage** is the narrow but deep channel southward of Bainbridge Island into Port Orchard. A small *fixed bright light*, elevated 25 ft., is shown on *Orchard Point*, on the South side of the entrance. A pole *beacon* stands on *Orchard Rocks*, on the East side of the passage, and a *red buoy* lies in 10 fathoms, 3 cables S.S.E. from them. In 1899, a 4-fathoms rock was found at 6 cables N.E. ¼ E. from Orchard Point light; it is marked by a *red buoy*.

Port Orchard.—Within Rich Passage, on the North side of Sinclair Inlet (the southern extreme of Port Orchard), is the U.S. government Puget Sound Navy Yard, at *Bremerton*. The dry dock, constructed of timber, with a masonry entrance and concrete floor, is 640 ft. long, with an entrance 90 ft. wide, having 30 ft. over the sill at mean high water. It is proposed to construct another large dry dock.

Page 337.—**Pully Point.**—A *fixed white* lantern *light*, elevated 16 ft., is shown on a pile at the extremity of the point.

Colvos Passage is now rarely used, most vessels passing eastward of Vashon Island.

Page 337.—**Commencement Bay.**—A small *fixed bright light*, elevated 20 ft., is shown from a white frame tower on *Brown Point*, on the North side of the entrance. In foggy weather, a *Bell* is struck *once* every 20 *seconds*.

Page 338.—**TACOMA** contained 37,714 inhabitants at the census in 1900, and is now connected with the Canadian and United States railway systems, and is the chief place of trade of this region, having lines of steamers to Hawaii, Japan, Europe, etc. The exports are chiefly wheat, flour, coal, timber, and tinned salmon, valued at £2,751,952 in 1904. The largest vessels can always lie afloat alongside the wharves, which are equipped with spacious warehouses and all modern appliances. There are also mooring buoys for large vessels. Steamtugs may be had, and are sometimes met with as far seaward as Cape Flattery. There are several foundries and engineering works, where repairs can be executed for vessels and their machinery. Stores, fresh supplies, and water are plentiful; coal is abundant and cheap. Hospitals and a Seamen's Home are maintained.

Quartermaster Harbour.—A *red buoy* lies in 8 fathoms, off Piner Point shoal, on the East side of the entrance. There is a pontoon dock here, 325 ft. long, capable of raising a weight of 5,000 tons, and there are facilities for repairs, &c.

Vashon Island.—The peninsula off the eastern side is named *Maury Island*. On *Robinson Point*, its eastern extreme, is a white frame lighthouse, 25 ft. high, showing a *fixed red light*, elevated 40 ft.; in foggy weather, a steam *Whistle* sounds a blast of 6 *seconds* in every *minute*.

Page 339.—**Balch Passage.**—A small *fixed bright light*, elevated 25 ft., is shown on the South end of Eagle Island. On the North side of the eastern entrance is the Washington State prison.

Toliva Shoal, of 2¼ fathoms, 1 mile S.S.E. from the South end of Fox Island, is now marked by a *buoy*.

Page 340.—**Olympia** now contains about 4,500 inhabitants. A channel, with 12 ft. in it at low water, is being dredged up to the town, and improvements are in progress.

Page 341.—**Port Gamble.**—A small *fixed bright light* is shown on a pile beacon in 20 ft. water, on the East side of the entrance. The anchorage is exposed to the S.E. storms of winter, and vessels beaching here for cleaning, etc., must beware of being surprised by them. Small vessels can be placed on a gridiron, having 12 ft. over it at high tide.

Squamish Harbour.—A rock, with 7 ft. over it, is reported to lie one-third of a mile W.S.W. of the southern Sister Rock.

Page 342.—**POSSESSION SOUND.**—*Muckilteo* is on the railway connecting Seattle with Bellingham Bay and the North.

Light.—On *Point Elliot*, near the windmill on the N.W. point of Muckilteo, stands a square white wooden tower, about 35 ft. high, showing a *flashing bright* light every 5 *seconds*, elevated 33 ft., and visible 11 miles. In foggy weather, a *Trumpet* will sound a blast of 4 *seconds* in every 20 *seconds*.

Port Gardner, *Everett*, or *West Everett*, is situated on the coast, 3 miles southward of the mouth of Snohomish River, and 4 miles north-eastward of Muckilteo. It is an important town, connected with the railway system, and having iron and shipbuilding works, paper mills, &c. The wharf has 28 ft. alongside at low water. Harbour works are in progress here.

Snohomish River forms a shallow delta at its mouth, and almost dries at low water. When within this there are depths of 6 to 8 ft. at low water, up to the town of *Snohomish*, 14 miles from the sea. The tide rises 12 to 14 feet. A channel is now being dredged across the flats into the river.

Pages 342, 343.—**Port Susan, &c.**—The channel over the flats at the North end is marked by *red spar buoys* on its eastern side, in depths of 9 to 10 ft. at high water. The western side of the channel over the flats in Skagit Bay, from *Utsalady* to *Stanwood*, on *Stillaguamish River*, is marked by similar *buoys*, in 12 to 15 feet. The southern side of the channel, from Utsalady to *Skagit River*, is also marked by similar *buoys*, in 12 to 16 feet. Several small *lights* are shown for the use of coasting vessels, in *Skagit Bay*, &c.

The navigation of *Skagit River* has been much improved by the removal of snags, etc. *Swinohomish Slough*, northward of Skagit Bay, has had its southern entrance

improved by dredging and embanking, and coasters drawing 4 ft. can now reach the town of *La Conner*.

Page 343.—**Partridge Point** has boulders extending about half a mile off it, and steep-to. A *red Bell buoy* lies in 15½ fathoms, outside the kelp, and about 1 mile off the point, with Wilson Point lighthouse bearing S.E. ½ S.

Page 344.—*Partridge Bank.*—The shoalest spot, with 2¼ fathoms, lies 3⅓ miles S.E. by S. ½ S. from Smith Island lighthouse, and is marked by a *black can buoy* on its northern edge.

Smith Island.—*Minor Islet*, at the extremity of the eastern spit, has a *beacon* on it, at 1 mile N.E. ½ E. from Smith Island lighthouse; the beacon is a white concrete truncated pyramid 12 ft. high, surmounted by a staff and black ball 15 ft. higher.

Deception Passage.—A small *fixed bright light*, elevated 40 ft., is shown on the S.W. point of Fidalgo Island.

Lawson Rock is marked by a *Bell buoy*, painted in *red* and *black bands*, lying in 6 fathoms off its eastern side, with Deception Islet bearing N.E. by E., distant 1½ mile.

Page 345.—**ROSARIO STRAIT.**—*Davidson Rock.*—See Addenda for page 352.

Burrows Bay.—A small *fixed bright light* is shown on the wharf.

Burrows Island Lighthouse is a square white wooden tower about 35 ft. high, standing on the western point, and showing a *fixed* light, elevated 57 ft., and visible 13 miles; *red* between S. 73° E. and S. 14° E., over dangers, and *bright* elsewhere, but obscured by land eastward between N. 3° W. and S. 25° E. In foggy weather, a *Trumpet* sounds *two* blasts of 4 *seconds* every 40 *seconds*, thus: blast, silent 7 seconds, blast, silent 25 seconds.

Page 346.—**Guemes Channel** is the passage between Guemes Island and the North end of Fidalgo Island, and has a *red buoy* lying in 4 fathoms, on the South side of the western entrance, at 3 cables N.E. ½ N. from *Shannon* or *Ship Point*. *City of Seattle Rock*, with 9½ ft. over it, is marked by a *red buoy*, in 14 feet. There is a branch railway to Shannon Point, passing the settlement of *Anacortes*, on the North side of Fidalgo Island. In clear weather, with a strong flood tide, vessels bound to Bellingham Bay from the southward usually pass through this channel.

Pages 346-347.—**Bellingham Bay, &c.**—Several dangers have been found in the channels leading to Bellingham Bay, and buoys have been placed to mark some of them. Some small *lights* are also exhibited, to assist in the navigation, which is not recommended without local knowledge or the aid of a pilot. With ebb tide, small vessels bound westward pass through *Hale Passage*, eastward of Lummi Island. *Bellingham* (formerly *Whatcom* and *Fairhaven*) and the other settlements on Bellingham Bay are connected with the railway system, one line passing northward to Drayton Harbour, etc. Coal was not to be had here in 1904.

Page 347.—**Lummi Island.**—A *Telephone Cable* crosses Rosario Strait from Lawrence Point, Orcas Island, in a N. 28° E. direction, and is continued across *Hale Passage* to the Indian reservation in Bellingham Bay.

Page 348.—**Drayton Harbour** entrance is only 1¼ cable wide, with about 4 fathoms least water in it, and vessels can here be safely beached for cleaning, etc. On its eastern side is the town of *Blaine*.

Light.—A white pile lighthouse stands in 3 ft. water, at 4¼ cables W. ⅔ S. from the western extremity of Tongue Point, on the southern side of the entrance to Drayton Harbour, and shows a *fixed red* light, elevated 42 ft., and visible 12 miles. It is obscured when bearing between North and West. In foggy weather, a *Trumpet* sounds *two* blasts of 3 *seconds* in succession in every *half-minute*.

Mud Bay, the N.E. angle of Boundary Bay, is filled by a mudflat, dry at low water, through which are several very shallow channels, marked by pile *beacons*, leading to *Nicomeck'l River*. Fishing stakes are placed near the outer edges of the shoals.

Page 351.—**VANCOUVER ISLAND, &c.**—**Haro Strait** forms the boundary between the British and United States territories, the latter including the Haro Archipelago, with Stuart, Waldron, and Patos Islands. See the Addenda for page 365.

Winds.—Among the Haro Archipelago, the winds are usually variable and baffling. In the main channels of Haro and Rosario Straits, they prevail from the S.W. during summer, but vessels usually meet with a head wind on emerging from them into the Strait of Georgia. In winter, gales from S.E. and S.W. are frequent.

Caution.—When navigating the waters of the British Columbian and Alaskan coasts, it must be remembered that they have not been closely surveyed, and that many uncharted dangers may and do exist.

Uniform System of Buoyage, &c.—The Canadian system is used in the waters of British Columbia. In approaching ports and channels from sea, buoys and beacons on the *starboard* side are painted *red*, and those on the *port* side *black*. Those marking middle grounds and obstructions, which may be passed on either side, are painted in *red* and *black bands*. Buoys painted in *black* and *white stripes* lie in mid-channel, and must be passed close-to. Prominent buoys may carry topmarks.

The United States system is described in the Addenda for pages 204-206.

Pages 352, 404.—**Fonte or Hein Bank.**—In February, 1904, the steamer *Alki* (drawing 16¾ ft.) struck on what was thought to be a small patch of hard clay and gravel, with about 13 ft. water over it at low water, lying near the patch of 3¼ fathoms shown on the chart. A *can buoy*, *red* and *black bands*, has been placed in about 6 fathoms, close northward of this patch, at 7 miles S. ⅔ W. from Cattle Point.

Davidson Rock is marked by a *black can buoy*, in 26 feet.

Page 353.—**Belle Rock** is marked by a *black can buoy*, in 9 fathoms, to E. by S. ¾ S. *Black Rock* is marked by a pole *beacon*, bearing a *barrel*.

The Peapods.—A small *fixed bright light* is shown on the N.E. extreme of the eastern islet. *Buckeye Shoal*, a small patch of 4 fathoms, lies 12 cables S.E. ½ E. from the East extreme of the Peapods.

Page 354.—**Lummi Island.**—A rock, with 12 ft. over it, about half a mile W.N.W. of Migley Point, the North point of the island, is marked by a *nun buoy*, in 7 fathoms, close to its S.E. side. A ledge, with 12 to 15 ft. over it, extends about 7½ cables E. by N. ¾ N. from Migley Point.

Pages 354-355.—**Alden Bank** is marked by a *can buoy*, *black* and *red bands*, lying near the shoalest part.

Page 355.—**Cattle Point.**—A small *fixed bright light*, elevated 100 ft., is shown on the southern extremity of San Juan Island.

Salmon Bank. A *black spar buoy* lies in 7 fathoms, off the outer edge, with Cattle Point light bearing North.

Page 356.—**Griffin Bay.**—*New Shoal*, with 3 ft. over it, in the fairway of the entrance to *North Bay*, 6 cables E. by N. from the North end of Dinner Island, is marked by a *spar buoy*.

Turn Rock is marked by a pole *beacon*, bearing a *barrel*.

A *Telephone Cable* crosses to Shaw Island from a point about 6 cables N. 20° W. from the North point of Brown Island, Friday Harbour.

Reid Rock is marked by a *nun buoy*.

Page 357.—**Patos Island.**—A small *fixed red light*, elevated 30 ft., is shown on *Alden Point*, the western extremity; in foggy weather, a Daboll *Trumpet* sounds a blast of 2 *seconds* in every 20 *seconds*.

Page 358.—**Clements Reef** is marked by a *red nun buoy*, lying in 13 fathoms, about 2½ cables N.E. of it.

Page 359.—**Upright Channel.**—*High Water* or *Shag Rock* is marked by a pole *beacon*, bearing a *barrel*.

Page 361.—**Thatcher Passage.**—*Lawson Rock* only uncovers at very low tides, and is marked by a *can buoy*, painted in *red* and *black bands*, lying in 6½ fathoms, near its southern edge.

Maury Passage.—A small *fixed bright light* is shown on the southern extreme of *Decatur Island*.

Obstruction Island.—A small *fixed bright light*, at an elevation of 24 ft., is shown on the S.E. point, and a *fixed red light* on the S.W. point. A pole *beacon*, bearing a *barrel*, stands on a rock in *Peavine Pass*, close to the North end of Blakely Island. *Lydia Shoal*, a small patch of 3¾ fathoms, lies 1 mile N. 58° E. from the eastern light on Obstruction Island.

Page 362.—**ORCAS ISLAND.**—A *Telephone Cable* crosses Rosario Strait from Lawrence Point, in a N. 28° E. direction, to Lummi Island.

Page 363.—**Harney Channel.**—A *Telephone Cable* crosses about half a mile westward of Hankin Point.

Page 364.—**HARO STRAIT.—Discovery Island Light, &c.**—See the Addenda for page 402.

Page 365.—**Zero Rock** is awash at high water, and is marked by a *black* stone *beacon*, with a pole bearing a conical topmark, elevated 28 feet. Discovery Island light is obscured over it and the detached rocks lying from 1 to 1½ mile westward.

Kelp Reefs.—A stone *beacon*, 20 ft. high, stands on the eastern side, and the buoy has been removed. A 3-fathoms patch lies northward of Darcy Island.

Directions.—In clear weather, with *flood* tide, the U.S. authorities recommend the following route for steamers bound from Victoria to Vancouver, the distance being shortest, water smoothest, and tide of the most assistance :—Passing through Enterprize Channel (page 401), or South of Trial Island, according to the vessel's draught, continue on through Mayor and Baynes Channels (westward of Chain Islets and Chatham Island), and, passing on either side of Zero Rocks and Darcy Shoals, enter Sidney Channel. Thence pass through Moresby Passage (page 373), westward of Moresby Island, and continue through Swanson Channel and Active Pass to the Strait of Georgia, when a course may be shaped for Burrard Inlet. In this route, the tidal streams are weaker than in the main Haro Strait.

With the *ebb* tide, the usual route is outside Trial Island to the main channel of Haro Strait, following the latter to the Gulf of Georgia. This route is recommended in thick weather, and also, at all times, to navigators not familiar with the tides and dangers of the narrower channels.

Some of the fastest steamers, after passing outside Trial Island, and partly through Haro Strait, at ebb tide, stand up Swanson Channel and through Active Pass.

Victoria to Nanaimo and Departure Bay.—With *flood* tide and clear weather, pass through Enterprize, Mayor, Baynes, Swanson, and Trincomalie Channels, and Dodd Narrows. By this route the smooth water and strong tide will be of great assistance. On the southward trip this route should also be followed when the tide is *ebb*.

With adverse tides the usual route is through the main channel of Haro Strait and the Gulf of Georgia.

Page 366.—A *Telephone Cable*, connecting Vancouver Island with the mainland at Bellingham Bay, crosses the southern part of Haro Strait, from Telegraph Cove to St. Andrew Bay, San Juan Island.

Cormorant Bay.—A *black can buoy*, lying in 12 fathoms, marks the eastern edge of *Johnstone Reef*. A 2-fathoms rock, usually marked by kelp, lies 2¼ cables S.S.W. of the S.E. rock of Johnstone Reef.

Page 367.—**Plumper Sound.**—A 22-ft. rock was reported to lie 11 cables East of Blunden Island, but, in 1895, H.M.S. *Nymphe* could find no bottom at 70 fathoms hereabout. It is considered not to exist. A small rocky patch, with about 16 ft. over it, lies on the eastern side of the sound, 2¾ cables W. by N. from Croker Point.

Hope Bay lies inside *Fane Islet*, on the N.E. side of *Pender Island*, and here is a settlement, with a wharf.

SATURNA ISLAND Lighthouse is a square white wooden tower, 60 ft. high, standing on the East point, showing a *revolving bright* light every *half-minute*, elevated 125 ft., and visible 18 miles seaward, between N.W. by W. ¼ W. and S.W. ½ S.

Orcas Knob, well open East of Waldron Island, S.E. by S. ¾ S., leads clear of *Rosenfelt Reef* and the foul ground eastward of *Tumbo Island*, which is marked by a *black can buoy*, carrying a cage, lying in 12 fathoms, off the extremity.

A 2-ft. rock lies in the kelp, at 1½ cable E. by S. from *Edith Point*, on the North coast of *Mayne Island*.

Page 368.—**Enterprize Reefs** are marked by a *black* stone *beacon*, 20 ft. high, near the western extremity.

Village Bay, on the West coast of Mayne Island, near Helen Point, affords good anchorage in 10 fathoms.

Page 369.—**Stuart Island.**—A small *fixed bright light*, elevated 38 ft., is shown on *Turn Point*, and in foggy weather a *Trumpet* sounds a blast of 3 *seconds* in every *half-minute*.

Page 371.—**Directions.**—With a strong flood tide, vessels bound to the southward from *Roche Harbour* are recommended to pass through Spieden and President Channels, passing westward of Barnes Island into Rosario Strait. With the ebb, in clear weather, Spieden and San Juan Channels can be used.

Page 372.—**WESTERN CHANNELS of HARO STRAIT.**—Numerous rocks and shoals have been found near the fairways of these channels, for the particulars of which reference must be made to the most recent large-scale charts. Only the more important are noticed here.

Sidney, situated on the Vancouver coast, in lat. 48° 39′ N., is connected with Victoria, 16¼ miles distant, by railway. The railway wharf extends 500 ft. off shore, and has a depth of 20 ft. alongside its outer face at low water springs.

Shoal ground, 1¼ to 4 fathoms, extends about 3 cables off the town, its outer edge being marked by two *red spar buoys*. *Victorian Rock*, on which the steamer of that name struck in 1903, has 12 ft. over it, and lies 860 ft. from the wharf, with Sidney Spit beacon bearing N.E. by E. ¼ E.; a small *red buoy* lies in 3½ fathoms, E. by N, from it. A depth of 9 ft. is found about 3½ cables N. by E. ¾ E. from the wharf.

Sidney Channel.—A *black can buoy* lies off the eastern edge of the 3½-fathoms patch about 6 cables West of Darcy Island, in the southern entrance of the channel.

A rock, with 20 ft. over it, lies about 1 cable off the West side of Sidney Island, with the beacon on Sidney Spit bearing N.W. by N. ⅝ N., distant 1⅓ mile.

A 3-fathoms spit extends about 3 cables northward from the N.E. point of *James Island*. Another spit, with 1½ to 18 ft. over it, extends 1¾ mile south-eastward from the southern side of this island.

Sidney Spit has a conical wooden *beacon*, 50 ft. high, upper part *white* and lower part *black*, on its N.W. extreme. The rocky patches lying off the western point of Sidney Island are marked by a *conical red buoy* off their western end, and by a *black can buoy* on their eastern end.

Mount Tuam appearing between the notches on James Island is no longer available as a leading mark.

Cordova Channel.—There is secure anchorage in *Cordova Bay*, on the western side of the channel.

Page 373.—**Shute Passage.**—On *Dock Islet*, the northernmost of the *Little Group*, stands a white wooden tower, exhibiting an unwatched *fixed bright light*, elevated 40 feet, and visible 10 miles. Some sunken rocks lie in the channel between this and Jones Island.

The rock lying 1 mile N.E. of *Coal Island* has 3½ (not 4) fathoms over it. *Celia Reef* is marked by a *conical red buoy* southward of it.

Pages 373-374.—**Moresby Passage.**—*Canoe Rocks* are marked by a *black* stone *beacon*, 25 ft. high.

Page 374.—**Satellite Channel.**—A *black* stone *beacon*, 18 ft. high, stands on *Shute Reef*.

Page 375.—**SAANICH INLET.**—Cement is manufactured at *Tod Inlet*, which can be entered by large vessels.

COWITCHIN HARBOUR.—There is a settlement on the South side of the harbour, with a long pier, where timber is shipped. The railway between Victoria and Nanaimo passes about 1 mile inland.

Page 376.—**Sansum Narrows.**—A *can buoy*, *red* and *black bands*, lies near the S.W. edge of *Kelp Reef*, about 3 cables S.W. by S. from Entrance Point.

Page 376.—**Osborn Bay.**—A *black can buoy* lies N.E. of *Indian Reef*, just drying at low water, eastward of *Shoal Islands*. Shoals extend about 3½ cables northward of these islands.

Page 377.—**Chemainus** or *Horse-Shoe Bay* is sheltered from all but N.W. winds, and on its western side is a settlement, with about 1,500 inhabitants, close to the railway. Vessels could obtain spars from the sawmill. There is anchorage in 10 to 20 fathoms, and 18 to 24 ft. alongside the wharves at low water. If required, a steam-tug can be had from the sawmill, where timber is shipped in considerable quantities. Fresh supplies and water can be had here, but there are no coal stores.

A narrow ridge, with some rocky heads of 2 to 3 fathoms on it, extends about 4 cables westward from the entrance of the bay, its eastern extreme lying 2¼ cables N. 19° W. from Bird Rock. A patch, with 11 ft. least water, lies 2⅓ cables East of Bird Rock; and a rocky 3-fathoms patch lies 3¼ cables E. ¼ N. from Bare Point light. A rock, with 16 ft. water over it, lies on the West side of the entrance, at 2¾ cables W. by S. ½ S. from Bare Point light.

A *fixed bright light*, elevated 36 ft., and visible 11 miles, is shown from a lantern on a white house 30 ft. high, near the extremity of *Bare Point*.

Oyster Harbour is becoming of importance, owing to the construction of extensive coal wharves, reaching into depths of 5½ and 6 fathoms, at the town of *Ladysmith*, on its southern shore, and connected with the railway. Coal is here shipped in large quantities from the adjacent mines, and furnaces have been established for smelting copper-ore.

On *Coffin Islet* stands a white wooden tower, exhibiting an unwatched *fixed bright light*, elevated 29 ft., and visible 10 miles.

A depth of 19 ft. is found at about 2½ cables S.W. by S. ⅔ S. from the lighthouse; this is the extremity of a narrow ridge of 2 to 3 fathoms extending from the ledge in Evening Cove, at 5¼ cables S.W. by W. ½ W. from the lighthouse.

In 1904, the officers of H.M.S. *Egeria* found a rock with 6 ft. over it, at $1\frac{3}{10}$ cable N. 61° E. from Coffin Islet lighthouse, and another with 12 ft. over it at $1\frac{8}{10}$ cable N. 64° E. from the lighthouse.

The rocks off the South side of *Twin Islets* are marked by a stone *beacon*; and another *beacon* marks the edge of the flats extending off the southern shore, at 6 cables eastward of the wharves.

Chemainos Bay is now known as *Kulleet*. A rock, nearly awash at low water, lies 2 cables eastward of *Yellow Point*.

A rock, with 8 ft. over it, lies 4 cables S. ⅔ W. from Reef Point, the N.W. point of *Thetis Island*, and other rocks have recently been found nearer the shore.

Dodd Narrows.—In 1904, the officers of H.M.S. *Egeria* found a 6-ft. sunken rock, 180 yards off the North point of Round Island, and another of 12 ft. 4 cables W. by S. from the islet off the South side of Mudge Island. A 4-fathoms shoal was also found at 540 yards E. by N. from the islet close South of Round Island.

North Reef is marked by a *white* wooden *beacon*, 40 ft. high, 5 cables S. by E. ½ E. from the S.E. point of Tent Island. Foul ground extends 2½ cables E.S.E. from this reef. *Escape Reef* is marked by a *white* wooden pyramid *beacon*, with staff and drum, rising 20 ft. above high water.

Pages 378, 379.—**False Reef,** 3½ cables W. by N. ½ N. from Scott Island, is marked by a *can buoy*, *black* and *red bands*, lying southward of it. There is said to be no kelp on this reef.

White Rock has a ridge of 2 to 5 fathoms extending 2 cables north-westward from it, a *red can buoy*, with staff and *cage*, lying off its extremity. Several sunken dangers have been found in the passage between White Rock and Ragged Island.

Danger Reef is marked by a *black* wooden *beacon*, on the easternmost rock, surmounted by a white turret exhibiting an unattended *fixed bright light*, elevated about 24 ft., and visible 9 miles.

Vesuvius Bay is the small bight northward of the bay so described, and there is a settlement here.

Page 378.—**Grappler Reef** is marked by a *black can buoy*, lying in 7 fathoms, off the S.W. extreme.

TELEGRAPH HARBOUR has a depth of 8 fathoms in its outer part. On the eastern side is a settlement, with a wharf reaching into 9 ft. water. A rock with 4 ft. water over it lies nearly half a mile N. 31° E. from the eastern extremity of Hudson Island; another, with 12 ft. over it, lies 6½ cables N. 70° W. from Escape Reef beacon; and another, with 5 ft. over it, about 1½ cable S. 5° E. from Active Point.

Page 379.—**Preedy Harbour.**—*False Rock*:—see Addenda for pages 378, 379.

Admiral Island is locally known as *Saltspring*, from the settlement of that name at its northern end, where are some salt springs.

Page 380.—**GANGES HARBOUR.**—A *black can buoy* marks the 1-fathom patch lying 2 miles W. by N. ½ N. from the southernmost Channel Islet. *Horda Rock*, with 2 fathoms least water, lies in the southern approach to *Captain Passage*, at 6½ cables S.S.E. from Nose Point; a *black can buoy* lies close to its eastern side. In 1905, the following dangers were discovered by H.M. surveying vessel *Egeria*:—A 2-fathoms pinnacle at 3½ cables S. 65° W. from Liddell Point; a 3-fathoms rock at 7 cables S. 73° W. from Liddell Point; a 2½-fathoms rock at 10⅓ cables S. 73° E., a 3-fathoms shoal at 3½ cables S. 40° W., a 4-ft. shoal at 3½ cables S. 58° W., a 3-fathoms shoal at 14 cables S. 32° E., a 1¾-fathom shoal at 13 cables S. 51° W., and a 5-fathoms shoal at 3½ cables N. 77° E., from the southern point of Long Harbour entrance.

Page 381.—**Prevost Island Lighthouse.**—On *Portlock Point*, the eastern extreme of the island, is a white wooden tower, 48 ft. high, showing a *fixed* light, elevated 72 feet, and visible 10 miles; it shows *bright*, with a *red* sector over Enterprise Reef. In foggy weather, a *Bell*, 300 yards S.E. of the lighthouse, is struck *once* every 15 *seconds*.

Pages 381-382.—**ACTIVE PASS** was examined by the officers of H.M.S. *Egeria*, in 1904, when the charts were found to be incorrect. A 5-ft. rocky patch was found at 4½ cables N. 15° W. from Helen Point, and an 18-ft. rock at 1⅓ cable N. 20° E. from that point. Mary Anne Point bearing S. ¾ W. is a good line for the northern entrance of the pass.

Enterprise Reef is marked by a *beacon*; as already described in the Addenda for page 368.

Page 382.—**Miners Bay** has a settlement in it named *Mayne*, where there is a conspicuous church. The wharf reaches into 8 ft. at low water. The rock reported off *Laura Point* is considered not to exist.

In *Sturdies Bay* is a wharf reaching into 15 ft. at low water.

Georgina Point Lighthouse, on the eastern side of the North entrance to Active Pass, is a square white building, 42 ft. high, showing a *fixed bright* light, elevated 55 feet, and visible 12 miles northward, between S. W. $\frac{1}{2}$ S. and E. $\frac{1}{2}$ N. In foggy weather, a *Horn* sounds a blast of 10 *seconds* in every *minute*.

A 5-ft. shoal lies $2\frac{1}{2}$ cables N. 18° E. from Georgina Point lighthouse, and breaks occasionally. A 5-fathoms shoal, $5\frac{1}{4}$ cables W. $\frac{1}{4}$ N. from the lighthouse, is usually marked by heavy tide-rips. *Gossip Island* reef is marked by a *black can buoy*, in 5 fathoms.

Large or deeply-laden steamers should only pass through Active Pass at or near slack water, which occurs one hour after high or low water at Port Townsend.

Page 383.—**TRINCOMALIE CHANNEL.**—*Benmohr Rock*, on which the steamer of that name touched in 1900, lies nearly in mid-channel in the southern entrance, at 7 cables N. $\frac{1}{2}$ E. from Peile Point; it has $14\frac{1}{3}$ ft. over it at low water, and is marked by a *can buoy*, painted in *red* and *black bands*. A 4-fathoms patch lies eastward of this rock, at 11 cables N. 47° E. from Peile Point.

A 3-fathoms pinnacle lies over 4 cables N. 80° W., and a 12-ft. patch lies $9\frac{1}{4}$ cables N. 42° W., from the western Twin Island.

Atkins Reef is marked by a *white* stone *beacon*, with staff and ball, rising 9 ft. above high water. At its S.E. extreme is a rock awash at low water, $4\frac{1}{3}$ cables S. 75° E. from the beacon, with depths of 2 to 5 fathoms between, and 13 to 17 fathoms close outside it.

Page 384.—**Governor Rock** is marked by a *conical black buoy*, lying in 7 fathoms, off its eastern side.

Walker Rock has a *white* stone *beacon* on it, and a rocky ridge extends $2\frac{1}{4}$ cables westward of it, with a $2\frac{1}{4}$-fathoms pinnacle near its extremity. A *fixed bright light*, elevated 15 ft., and visible 8 miles, is shown on the beacon.

Victoria Rock, on which the S.S. *Victoria* struck in 1902, has 15 ft. over it at low water, with no kelp on it, and lies 12 cables S.W. of Walker Rock beacon. A *can buoy*, *red* and *black bands*, lies off its N.E. side. A 3-fathoms pinnacle lies 3 cables north-eastward of Victoria Rock.

At *Fernwood*, 3 miles south-eastward of Southey Point, is a wharf reaching into 9 ft. water.

A rock, with 6 ft. over it, lies in the eastern approach to Houston Passage, at 5 cables S. 66° W. from the S.E. extreme of Narrow Island, with foul ground between.

A rock, drying 4 ft., lies on the eastern extreme of the foul ground extending $1\frac{1}{4}$ cable E. $\frac{1}{4}$ N. from the islet southward of Reid Island.

Page 385.—**PORTIER PASS** should be avoided by those without local knowledge, as several other dangers have recently been found in it, and the tidal streams run from 4 to 9 knots. In 1905, the officers of H.M.S. *Egeria* advised vessels not to make use of this pass, owing to its narrowness, and the oblique direction and strength of the tides (see remarks on page 383).

Black Rock dries 11 ft. at low water. The position of *Romulus Rock*, with only 5 ft. over it, on the South side of the western entrance, is pointed out by two pairs of *beacons* on the shore; a *black spar buoy* lies S.E. of *Virago Rock*; and a *black* and *white striped can buoy*, with staff and *drum*, lies off the eastern entrance, at $3\frac{1}{4}$ cables E. by S. $\frac{3}{4}$ S. from Canoe Islet.

Lights.—On the western end of Galiano Island are two white towers, 400 yards apart, each showing a *fixed bright* light, which in line bearing S. 5° E. lead through the eastern entrance into Portier Pass. The outer light, on *Race Point*, is elevated 21 feet, and visible 9 miles; the rear light, elevated 32 ft., is visible 11 miles.

Page 386.—High water, on full and change, occurs at about 4h. p.m.

CLAM BAY.—A 3-fathoms patch lies over $1\frac{1}{2}$ cable N. 15° E. from the North end of White Spit; vessels should pass southward of it. A 5-ft. rocky pinnacle lies nearly midway between Centre Reef and Rocket Shoal.

Page 387.—**DODD NARROWS.**—(See Addenda for page 377). There is a depth of about 3 fathoms in *False Narrows* at high water, but this channel can only be safely used by those having local knowledge; it is marked by *buoys* and pile *beacons*.

In Dodd Narrows, slack tide usually lasts 15 to 20 minutes, the stream setting north-

ward from 25 minutes after low water to 30 minutes before high water at Port Townsend, but the change may occur as much as one hour earlier or later than this.

PYLADES CHANNEL.—A rock, drying at lowest tides, lies about 3½ cables N.E. ⅜ E. of the narrow passage between the two northern De Courcy Islands; and a rock, awash at low water, lies 220 yards off the eastern extreme of the easternmost De Courcy Island.

Page 388.– **GABRIOLA PASS.**—Telegraph wires, in connection with the cable from the mainland, cross the pass, at an elevation of 30 feet. The tidal streams here run from 5 to 6 knots.

Gabriola Reefs, &c.—See the Addenda for page 468.

Pages 388-389.—**VANCOUVER ISLAND** has an area of about 20,000 square miles, and its interior still remains mostly unexplored, but the Canadian Pacific Railway Company is about to undertake a thorough exploration, to ascertain whether its resources are capable of development by railway extension. *Victoria Peak*, its highest elevation, rises to a height of 7,484 ft., in lat. 50° 4′ N. The coal-fields are now largely worked, the output in 1904 amounting to 1,023,013 tons.

Page 390.—**Currents.**—As already stated (in the Addenda for page 322), it now appears that there is a constant north-westerly set along the western coast of Vancouver Island, reaching from 25 to 50 miles off shore. Outside this, there is a prevalent set to the S.E., most noticeable during summer (when westerly and N.W. winds prevail) and autumn.

Page 392.—**Fog.**—See the Addenda for page 324.

Pages 393, 405.—**CARMANAH Lighthouse**, 2 miles W. by N. ½ N. from Bonilla Point, is a white wooden building, 46 ft. high, showing a *flashing bright* light, elevated 173 ft., and visible 19 miles; *three flashes*, separated by intervals of 15 seconds, and followed by a partial eclipse of 30 seconds. In foggy weather, a *Horn* sounds a blast of 6 *seconds* every *half-minute*.

A *Signal Station* is established at the lighthouse, connected with Victoria by telephone, for the use of which there is a tariff. In foggy weather, vessels may communicate by whistle sounds, using the Morse or Continental telegraphic codes, and they will be answered by a whistle.

Provision Depôt.—See the Addenda for page 321.

PORT SAN JUAN is also known as *Port Renfrew*. The settlement is in *Snuggery Cove*, on its southern shore, where a wharf reaches into 15 ft. water, protected by a breakwater. There is telephonic communication with Victoria. A *red Whistle buoy* lies in 14 fathoms, 6¼ cables S. 75° E. from Owen Island.

Between Sombrio River and Sherringham Point the coast is fronted by a bank, on the western part of which vessels can anchor, in case of need.

Magnetic Variation.—See the Addenda for page 324.

Page 394.—**Sooke Inlet** has 14 ft. over the bar at low water, and can only be safely navigated by small vessels. The tidal streams run 3 to 4 knots at the entrance. Deposits of iron and copper ores and coal are found in this locality. The fairway of the channel to the wharf on the western shore of Sooke Harbour is marked by pile *beacons*.

Becher Bay.—A telegraph cable extends from the western point, across Juan de Fuca Strait, to Port Crescent.

Heavy tide-races form along the shore between Beechey Head and Esquimalt.

Page 395.—**RACE ISLANDS.**—*Rosedale Rock* was marked by a *black can buoy*, lying in 10 fathoms, 1¼ cable to E. ¾ S. It is liable to get adrift.

Race Island Lighthouse.—In foggy weather, a steam whistle will give four short blasts, in answer to a steamer's signals, if the northern portion of Juan de Fuca Strait is free from fog, as is often the case.

Race Passage has some patches of 6 to 8 fathoms in it.

Page 396.—**Parry Bay.**—From the anchorage, in 9 fathoms, William Head bears S.E. by S.

William Head.—Here is the *Quarantine Station*, with a wharf having depths of 25 to 30 ft. alongside. On the head are two beacon posts, 10 yards apart, on which *two fixed red lights*, visible 4 miles, are shown for the guidance of vessels coming hither for inspection. Such vessels must proceed northward until these lights are abeam, and then westward until they are in line, to S. by W. ½ W., defining the limit of the quarantine anchorage, which is also defined by Race Rock light being shut in by the head.

Coghlan Rock, of 2 fathoms, lies 3½ cables N.N.W. of Albert Head.

ROYAL ROADS.—Between May 15 and September 15 (when gun practice is carried on) vessels are forbidden to anchor eastward of the line S. 2° W. from Duntze Head to Race Rocks lighthouse, and nearer than 1 mile to Duntze Head. The *telegraph cable* from Ediz Hook (page 328) is landed about three-quarters of a mile westward of Albert Head, and vessels must avoid this locality when anchoring.

Pages 397-398.—**ESQUIMALT HARBOUR** is now strongly fortified, being the headquarters of the North Pacific Squadron on this coast, for the use of which a complete arsenal and coaling station was established on the southern side of Constance Cove, with mooring and other buoys off it. In December, 1904, the government decided to close this dockyard, and it is now being dismantled. The dry dock is 480 ft. long, with an entrance 65 ft. wide, having 29 ft. over the sill at high springs. A slip will also take up vessels 320 ft. long, and drawing 22 ft., of 2,500 tons weight. Ordinary repairs can also here be executed for merchant vessels and their machinery.

Esquimalt is connected with Victoria, 3½ miles distant, by railway and electric tramway. Fresh beef and bread can be had here, and water from a hydrant at the dock, but other supplies must be obtained from Victoria. Coal is supplied in any quantity by lighters, or large vessels can lie alongside the wharf here, or those drawing up to 25 ft. at the wharf at Thetis Island, and ship it direct from the railway trucks.

Duntze Head has a flagstaff on it, and just northward of it is *Grant Knoll*, 25 ft. high, on which stands the Bickford signal-tower, 92 ft. high.

Constance Cove is mostly occupied by mooring-buoys for warships and small vessels. *Village Rocks*, at the head of the cove, are partly uncovered when there is a depth of 24¾ ft. over the sill of the dry dock; a 4-ft. shoal, southward of them, was formerly the head of a pier, and is marked by a *red buoy*.

A 5-ft. rock lies near the South shore of *Plumper Bay*, about 3 cables S.E. by S. ¼ S. from Dyke Point beacon, with a depth of 14 ft. between it and the North coast of Inskip Island.

Whale Rock has a *buoy* off its South side, painted in *red* and *black stripes*. A 13-ft. rock lies midway between it and Macarthy Island; consequently, Yew Point touching the lighthouse on Fisgard Island is no longer a leading mark.

A small *buoy* lies in 11 ft., on the North side of the rock lying eastward of *Patterson Point*, on the West side of the northern part of the harbour.

Pilotage is compulsory for vessels entering Esquimalt Harbour. A pilot-vessel will usually be found cruising outside Race Islands, and steam-tugs are available.

Tides.—In Esquimalt and Victoria Harbours the tides are irregular, there being perhaps two tides daily (lunar) for about half of each fortnight, and then only one during the other half, this inequality following the declination of the moon. Spring tides rise 7 to 10 ft., and neaps 5 to 8 feet.

Pages 399-400.—**VICTORIA HARBOUR.**—The *Buoys* are now arranged on the Uniform System (see the Addenda for page 351).

Brotchy Ledge Light.—A conical black beacon on this danger exhibits an unattended electric *occulting bright* light, eclipsed for 20 *seconds* once in every *minute*, elevated 22 ft., and visible 9 miles. In foggy weather, a *Bell* is struck by electricity *once* every 10 *seconds*; if disabled an electric *Horn* will be sounded. The *bell buoy* is discontinued.

When strongest, the tidal stream sets towards Brotchy Ledge at a rate of about 3 knots an hour.

Berens Island Light is now *occulting*, eclipsed for 5 *seconds* once in every 20 *seconds*, and visible 10 miles; it shows *bright*, with a *red* sector over Brotchy Ledge between S. 31° E. and S. 36° E. In foggy weather, a *Bell* is sounded in answer to vessels' signals.

Shoal Point beacon buoy has been removed, and a *red spar* placed off the point in 9½ feet; the spit is now marked by a *red* pile *beacon*, on which an unattended *fixed red light* is shown, visible 3 miles. *Middle Rock*, farther in, is marked by a similar *black beacon*, bearing a *fixed bright light*.

VICTORIA contained 20,816 inhabitants at the census in 1901, it having increased greatly in importance since the growth of railway and steam communication. The railway is now open to Nanaimo, 73 miles distant, and there is daily communication by steamer with Vancouver, the terminus of the Canadian Pacific Railway. The two outer wharves, on the South side of Shoal Point, have depths of 27 to 29 ft. alongside, at low water, and are furnished with cranes and sheds. There are several slips, for vessels up to 500 tons weight, and repairs can be executed for vessels and their machinery. Steamtugs can be had, if required. The hospital will admit seamen. The dome of the government buildings is conspicuous from sea.

A channel 400 ft. wide, with a least depth of 13 ft., has been dredged from the wharf on the North side of Shoal Point to Laurel Point.

A small electric *fixed red light*, elevated 25 ft., and visible 1 mile, is shown on the western extremity of *Laurel Point*, at 430 yards N. 69° E. from the beacon light on Middle Rock.

Page 401.—A *telegraph cable* is laid between *CloverPoint* and New Dungeness.

Page 402.—**Mayor Channel.—Light.**—On *Fiddle Reef* stands a white wooden tower 30 ft. high, showing a *fixed* light, elevated 30 ft., and visible 8 miles; *bright* eastward between N. 14° E. and S. 8° E.; *red* thence over Thames Shoal to S. 40° W.; *bright* thence to N. 31° W.; and *red* thence to N. 14° E. over Five-fathoms Shoal.

Lewis Reef has a *black* stone *beacon* tower on it, surmounted by a *cross*. A 4-fathoms patch lies 3¾ cables to S. 14° E.

Page 402.—**DISCOVERY ISLAND Lighthouse**, on *Sea Bird Point*, the East extreme, is a square white wooden tower, 47 ft. high, showing a *fixed bright* light, elevated 91 ft., and visible 15 miles seaward, between N. 42° W. and S. 31° W. In foggy weather, a *Horn* sounds a blast of 8 *seconds*, with intervals of 1 *minute*.

A 9-ft. rock, marked by kelp, lies 4 cables S. by W. ¾ W. of Sea Bird Point, and a 15-ft. rock lies 75 yards N.N.W. of the 9-ft. rock, with 4 fathoms between.

Page 403.—**Fulford Reef** covers at one-third flood.

Telegraph Cove, on the North side of *Cadboro Point*, is very small, and at its head are some dynamite works, the wharf having a depth of 10 ft. alongside. Foul ground extends about 150 yards off the eastern point, and this must be carefully avoided by vessels entering. The tides set strongly across the entrance. (See Addenda for page 366).

Page 404.—**Tides.**—More recent observation shows that the remarks as to the tidal streams during the summer months are not correct.

Fonte Bank.—See the Addenda for page 352.

Page 405.—**Tides, &c.**—See the Addenda for page 390.

Soundings.—See the Addenda for page 323.

Bonilla Point is low and wooded, and should not be approached within 1 mile, as shoal ground extends more than half a mile off it, with deep water near the edge of the reef. Behind it the land gradually increases in height; *House Cone*, about 8 miles north-eastward of it, is about 2,500 ft. high, and forms a good landmark.

Carmanah Lighthouse.—See the Addenda for page 393.

Page 406.—**Nitinat Lake.**—About 1 mile eastward of the entrance is the settlement of *Clo-oose*, with a mission station, connected with Victoria by telegraph, and with Carmanah lighthouse by telephone; shipwrecked persons can obtain assistance here.

Pachena Bay.—A rock, awash at high water, lies half a mile S. by W. ⅜ W. from *Seabird Islet*; some other rocks encumber the passage between this islet and the shore eastward of it.

BARKLEY SOUND.—The former name of *Barclay* has been discarded by the government authorities.

Page 407.—**CAPE BEALE Lighthouse** is painted white, and stands on an islet off the extremity of the cape. The light, elevated 178 ft., now shows a *red* sector over Danger, Channel, and Western Reefs, between West and N.N.W. It is obscured when bearing westward of W. by N. ½ N. A depôt of provisions, etc., has been established here, for the benefit of shipwrecked persons (see Addenda for page 393). There is telephonic communication with Victoria, messages being transmitted at tariff rates.

Bamfield Creek has become of some importance as the landing place of the telegraph cable from Australia, completed in 1902. The station, named *Fleming* (after Sir Sandford Fleming), is built on the point between Bamfield and Grappler Creeks, and the wharf has a depth of 14 ft. alongside. The cable is laid near the eastern side of the entrance, and thence down the middle of Eastern Channel. A 6-ft. rock lies nearly in mid-channel, about half-way from the entrance to the anchorage. A 3-ft. rock lies in the middle of the narrow channel between Burls Island and Rance Island.

Ship Islet is now bare of trees.

Page 408.—**Diana Island.**—*Todd Rock* has from 1 to 2 ft. over it at high water, and a 3-fathoms kelp patch lies about 100 yards eastward of it. *Self Point*, the eastern extremity of *Helby Island*, appears like a wooded islet, and is an excellent mark at night.

Tzartoos Island.—Deposits of good iron-ore are now being worked here.

Pages 409-410.—**ALBERNI INLET.**—The village of *Alberni* is situated about 1½ mile up Sumass River, and contained 502 inhabitants at the census in 1901. It is in telegraphic communication with Victoria. There is a salmon fishery here. Deposits of copper, gold, and silver ore are now being exploited at *Uchucklesit Harbour*, etc.

A rocky patch, drying 3 to 4 ft. at low water, lies near the head of *San Mateo Bay*. The rock said to lie off *Mutine Point* has been searched for in vain, but an 8-ft. rock lies about 1 cable off shore, northward of the point, at $5\frac{3}{4}$ cables N.N.E. of the North point of Turn Island.

Page 410.—**First Narrows.**—A sandspit, drying at low water, extends about 100 yards from the western shore.

Stamp Harbour.—*Sumass River* has 3 ft. least water in its entrance, deepening to 9 ft. within. The channel is marked by *spar buoys*, *black* to West, and *red* to East. A wharf has been constructed at the entrance, with a depth of 24 ft. alongside at low water, and connected with *Alberni* by a good road. Steamers up to 150 ft. long, and up to 10 ft. draught, can reach the village at high water, and lie in 13 ft. alongside the wharf at low water. Fresh beef, vegetables, game, and fish are plentiful here.

Page 411.—**Directions.**—Ship Islet has no trees on it now.

Page 412.—**MIDDLE CHANNEL.**—Cape Beale light now shows *red* over the entrance, including Danger Rock and Channel and Western Reefs.

Page 413.—**Junction Passage.**—On *Seddall Island* is the village of *Ecoole*, with a wharf for small craft.

Pages 413-414.—**Broken Group.**—Several sunken rocks have recently been discovered in the channels among these islands, and others may exist. A rock, drying 3 or 4 ft., lies $3\frac{1}{2}$ cables S. by E. from the summit of *Redonda Island*.

Page 415.—**Seshart Channel.**—A rock, drying at very low tides, lies 1 cable E. by N. $\frac{3}{4}$ N. from the eastern extremity of Canoe Island, and another, drying 2 ft., lies 150 yards farther on. On the coast, opposite Canoe Island, is *Anderson's Wharf*, 202 feet long, reaching into 3 fathoms water.

Page 416.—**WESTERN CHANNEL.**—*Sail Rock* is 82 feet high. A reef, breaking at low water, extends $1\frac{3}{4}$ cable N. by W. from *Channel Rock*.

Page 417.—**Wayne Island** should read "*Mayne Bay*."

Page 418.—**Ugly Channel.**—Nearly midway between Double Island and Black Rock, is *Heddington Reef*, with two rocks on its eastern edge drying 6 to 10 ft.; a rock, awash at low water, lies near the West end. *Look-out Island* is 168 ft. high, and well wooded.

Ucluelet Arm.—At *Ucluelet* are some stores and a post-office.

On *Amphitrite Point* stands a small white frame tower, bearing an unattended *fixed bright light*, elevated 60 ft., and visible 13 miles.

Carolina Channel.—In 1905, a *red Whistle buoy* was placed in 25 fathoms, at 6 cables S. 10° E. from Amphitrite Point. A $3\frac{1}{2}$-fathoms rocky patch lies in Carolina Channel at $1\frac{3}{4}$ cable E. $\frac{3}{8}$ N. from the islet on the S.W. side of Round Island.

A 5-ft. pinnacle rock lies nearly 100 yards off the South entrance point of *Stewart Bay*, and $4\frac{3}{4}$ cables S.E. $\frac{1}{2}$ E. from Native Islet. Another 5-ft. rock lies $4\frac{1}{4}$ cables S.E. by S. $\frac{1}{2}$ S. from Native Islet. A rock, drying 2 to 3 ft., lies $5\frac{3}{4}$ cables S.E. $\frac{7}{8}$ S. from Native Islet. A $2\frac{3}{4}$-fathoms rock lies 3 cables N. $\frac{5}{8}$ E. from the wharf in the bay on the South side of Ucluelet Arm entrance.

Page 419.—*Sutton Rocks*, with 7 to 10 ft. least water, and 4 fathoms close around, lie 2 cables S.E. $\frac{3}{4}$ E. from the S.E. extreme of Channel Islet; a *spar buoy*, painted in *red* and *black bands*, lies on the southern rock.

Vessels are recommended not to approach the shore within 2 miles, when passing between Barkley and Clayoquot Sounds.

Page 419.—**CLAYOQUOT SOUND.**—Several settlements have been made here, and the coasting steamers regularly use *Templar Channel*. The easternmost and largest of the *Lennard Islets*, at the entrance, is wooded, and a reef extends off its S.E. point.

The LIGHTHOUSE, $2\frac{1}{2}$ cables W.S.W. from the eastern extreme of the largest Lennard Islet, is a white wooden tower 80 ft. high, showing a *flashing bright* light every $11\frac{1}{4}$ *seconds*, elevated 115 ft., and visible 16 miles. The light may be obscured by trees on the eastern part of the islet. In foggy weather, a *Trumpet*, about 100 yards south-eastward of the lighthouse, will sound a blast of 5 *seconds* every *half-minute*.

At 1 mile within Lennard Islets is *Wakennenish Island*, on the South point of which is the Indian village named *E-cha-chets*. *Village Island*, lying in the fairway has a 4-ft. rock northward of it, marked by a *black can buoy*. At the N.E. point of *Stubbs Island* is a wharf, with 18 ft. alongside at low water. The spit extending northward of this island is marked by a *black buoy*.

Page 420.—**Ship Channel.**—A shoal spit extends 4 cables westward of *Bare Islet*, and a breaking rock lies about half a mile W. by S. from its summit. A rock, which sometimes breaks, lies about half a mile E. by N. $\frac{1}{2}$ N. from *Sea Otter Rock*, and another lies about

2½ cables eastward of the latter. Broken water has also been seen 2½ cables North of Sea Otter Rock.

Page 421.—**Hecate Passage.**—Two rocks, one awash and the other dry at low water, lie nearly in mid-channel, at the eastern end of the passage. A platform *pyramidal black buoy*, carrying a *drum*, lies in 5 fathoms, on the southern edge of North Bank, at 8¾ cables S. 75° E. from White Islet. A similar *red buoy*, with a *ball*, lies in 5 fathoms, over 2½ miles East of White Islet, marking a drying rock in the eastern entrance.

Cat-face Mountains are 3,370 ft. high.

Meares Island has the settlement of *Clayoquot* at its S.W. end.

Page 422.—**Bedwell Sound** entrance is 1½ mile East of Cypress Bay.

Page 423.—**Browning Passage.**—Other rocks have been found here, and some are marked by spar *buoys*.

Page 424.—**Sydney Inlet.**—Sunken rocks are reported to lie 1½ cable S.E. ½ S. from *Sharp Point*.

Refuge Cove.—In entering, give Sharp Point a safe berth, and keep in mid-channel till past the 9-ft. rock lying 1 cable off the eastern shore at 2 cables within Sharp Point.

Rocky Pass, connecting Shelter and North Arms, is sometimes used by coasters, at slack tide.

Page 425.—On Flores Island, at half a mile North of *Base Point*, is the village of *Ahousat*, with a post-office, etc. There is good anchorage off it in 6 fathoms.

Pages 425-426.—**HESQUIAT HARBOUR.**—There is a large Indian village on the western shore, with a mission station, store, etc.

Page 430.—**Tah-sis Canal** has a salmon river at its head. *Tah-sis Narrows*, connecting Tah-sis Canal and Esperanza Inlet, are 1 cable wide, and deep, with weak tidal streams.

Page 434.—**ESPERANZA INLET.**—A rocky patch lies 8 cables S. 77° W. from the South end of Middle Reef, and another 3½ cables N. 24° E. from the North end; both break occasionally.

Page 435.—Rocks extend about 1½ cable off the N.E. extremity of *Double Island*.

Port Eliza.—*Birthday Channel* is 1½ cable wide in its narrowest part.

Page 437.—**Directions.**—Entering Esperanza Inlet, Double Island in line with Black Rock bears N. by E. ¾ E. Alter course when the Twins bear N.W. by W. (not W. by N.).

Page 438.—**Kyuquot Channel.**—The rock, 2 cables East of *Chat-Channel Point*, covers at a quarter flood.

Page 439.—**Kyuquot Sound.**—*Channel Rock* dries 8 ft. at low water, and to the S.E. of it is a rock drying 2 feet.

Pages 440-441.—**CLAN-NINICK HARBOUR** affords one of the best anchorages on the West coast of Vancouver Island, and is easy of approach, but *Halibut Channel* is the only safe entrance for strangers; in the latter lies a dangerous sunken rock, at 3 cables N.W. by N. ¼ N. from Trap Bluff.

Page 441.—*Village* or *Kyuquot Island* has a post-office and a church, and there is a large Roman Catholic chapel on the island next eastward of Village Island. *Louise Rock*, lying in the entrance of the harbour, has 6 ft. over it at low water, with deep water close around; it is not marked by kelp, and lies over 6 cables W.N.W. of Channel Rock, with the S.E. extreme of Granite Island bearing S.W. ½ S. A breaking rock lies 2 cables W. ¼ S. from the S.W. extreme of *Granite Island*.

Pages 441-442.—**Ou-ou-Kinsh Inlet.**—*Fairway Rock*, awash at low water, lies 10⅓ cables S.W. ⅛ W. from the summit of Clara Islet. The leading mark, the entrance of the inlet bearing N.N.E., is therefore not correct.

Page 443.—**Nasparti Inlet.**—Two rocks, marked by kelp, lie in the fairway S.E. of *Hat Island;* the inner one lies about 1 cable off the island, and the outer one, of 3 fathoms, lies 2¼ cables S.E. by S. ½ S. from the East extreme of the island.

Pages 448-449.—**QUATSINO SOUND.**—There is a store at *Winter Harbour*, and another at *Koprino Harbour*.

Page 449.—*Monday Shoal* is said to have less than 4 fathoms over it. Near *Hecate Cove* is a Norwegian settlement, with a store and post-office, and the wharf reaches into 3 fathoms at low water.

Page 450.—Works are now in progress for developing the coal deposits.

Page 452.—**Raft Cove.**—In moderate weather, heavy breakers are reported to have been seen at 7½ cables S.W. by S. ¾ S. from the North extreme of the South point of the entrance.

Page 454.—**BRITISH COLUMBIA** contained 178,657 inhabitants at the census in 1901, and its area is now estimated at 310,191 square miles, including Vancouver Island, &c. Victoria is the capital. The northern part of the coast is almost destitute of settlers, except for a few camps of timber cutters. The seas abound with excellent fish, and at the river mouths are extensive salmon fisheries and canneries. The South part of Vancouver Island and the Fraser River delta are suitable for the cultivation of barley, oats, and hops, but the climate is too cool and wet for the production of grain in the districts bordering on the ocean. In the more northerly parts not even potatoes can be grown.

In recent years, British Columbia has proved to be rich in minerals, of which the output has rapidly increased. In 1904, the output was valued at 18,977,359 dollars, including 277,807 oz. of gold valued at 5,704,908 dollars (exclusive of 10,337,000 dollars from the Yukon goldfields); 3,222,481 oz. of silver ; 15,495 tons of copper ; 16,360 tons of lead ; and 1,253,628 tons of coal (chiefly in Vancouver Island).

The long debated question as to the boundary between British Columbia and Alaska was settled in 1903 by the decision of the arbitrators appointed by the British and United States governments. On the South, the boundary line runs from Cape Muzon, the S.E. extreme of Prince of Wales Archipelago, towards Wales Island at the entrance of Portland Canal ; here it passes between Sitklan and Wales Islands, the latter and Pearse Island being awarded to British Columbia. Thence it passes along the middle of Portland Canal to its head ; but beyond this, to the north-westward, British Columbia is quite cut off from access to the coast, and is thus deprived of her claim to the Lynn Canal, the most convenient, and, at some seasons of the year, the only means of approach to the Yukon territory.

The YUKON RIVER GOLDFIELDS.—Owing to the discovery in 1897 of extremely rich deposits of alluvial gold around the upper regions of the River Yukon, notably on that affluent known as the *Klondyke*, great attention has been devoted to ascertaining the easiest and quickest routes for reaching the goldfields from the coast, and in the following pages information is given for the use of masters of vessels bound to this hitherto but little frequented region, in addition to that already provided in the Directory.

Victoria, Vancouver, and Seattle are the ports used by vessels bound to or from the various approaches to the goldfields, to which there may be said to be three main routes, of which the easiest, and that most suitable for heavy cargo, is by the Yukon River, during the short season from July to October, when it is free from ice, but this is also the longest, being about 4,400 miles, and taking about six weeks from Victoria to Dawson City.

The southern route, and that formerly preferred by many, is by the Stickeen River, a distance of about 1,650 miles, taking about 25 days from Victoria ; but by the Skagway or White Pass railway, the shortest route, about 1,450 miles, via the Lynn Canal, Dawson City can now be reached in about 8 days.

Ocean-going vessels discharge their passengers and cargo at Wrangel, at Skagway (in Lynn Canal), or into river boats at St. Michael's. Each of these, and other approaches, will be more fully discussed hereafter, in the Addenda to the pages on which they are described in the Directory. Of the intense winter cold of the gold-producing regions (61° below zero F. at Dawson in January, 1903), so close to the Arctic Circle, of the present difficulties of reaching them, and of other cognate matters, we cannot attempt to speak here, leaving these subjects to the special guides now available.

Page 456.—**Climate.**—In early spring, and late autumn (chiefly in November), navigation is sometimes seriously hindered by fogs. From an average annual rainfall of about 70 inches in the South it increases, in going northward, to over 100 inches. Storms are rarely experienced.

Page 457.—**PASSAGES.**—In navigating the inland waters of the British Columbian and Alaskan coasts, it must be borne in mind that they have not been closely surveyed, and that many uncharted dangers may and do exist.

Steamers running on summer excursions through these inland waters, as far as Glacier Bay, always use the main channel of Haro Strait to reach the Gulf of Georgia. Seymour Narrows, in Discovery Passage, should not be attempted except at *slack* water. Broughton Strait is generally used, and is recommended as the safest. After passing through this strait, keep the Vancouver shore aboard, follow Goletas Channel, and enter Queen Charlotte Sound by way of Christie Pass, which is said to be safe at all times and at all stages of the tide. Issuing from Christie Pass, a straight course is laid for Pine Island, which is left to the eastward ; thence for Egg Island, which is also left to the eastward, and thence the course is laid for Cape Calvert.

The inner passage is always to be preferred, for the reason that in winter there is less inconvenience from S.E. and S.W. gales, and in summer the fogs and high N.W. winds are partly avoided.

Proceeding northward from Cape Calvert, Mr. W. E. George, a qualified coast pilot, says vessels pass through Fitzhugh Sound, Lama Channel, Seaforth Channel, Milbank Sound, Finlayson Channel, and Grenville Channel to Chatham Sound. These channels, which are fairly well charted, offer no difficulties for the largest ships with an experienced pilot.

The usual track of steam-vessels through the inner channels of Alaska is from Chatham Sound to westward of Cape Fox, then through Tongas Narrows, Clarence Strait, Stikine Strait, and Sumner Strait to Cape Decision. Tongas Narrows is a perfectly safe passage for the largest steamers with a competent pilot. Sumner Strait, the best channel for large vessels, has some hidden dangers, notably McArthur Ledge, the Eye Opener, and Helen Rock. Wrangel Narrows is the passage commonly used by mail steamers of 1,000 tons burden, or 220 ft. in length, but is not a safe channel for larger vessels, or those exceeding 17 ft. draught, and its passage should only be attempted at high water slack.

From Cape Decision to Juneau, through Chatham Straits, Frederick Sound, and Stephen Passage, is open, clear navigation, for which the charts are sufficiently reliable, and, with an experienced pilot, there is no difficulty. Large steam-vessels bound to Sitka should take the sea passage via Cape Ommaney, but, if required to touch at Juneau, may proceed to sea from there by way of Cross Sound.

Cross Sound presents no difficulties to navigation, except that at times great quantities of ice-floes, drifting with the strong currents, render the passage somewhat dangerous, and only to be undertaken in clear weather, or daylight. Anchorages may be found at Hooniah, Willoughby Cove, Bartlett Bay, and along the S.E. shore of Gustavus Point, towards Pleasant Island. The passage inside Pleasant Island, to the northward, also affords fair anchorage, but, in the absence of surveys, should not be attempted without a local pilot.

For remarks as to Magnetic Variation, see the Addenda for page 324.

For the routes between Victoria, Vancouver, and Nanaimo, see the Addenda for page 399.

Page 457.—**STRAIT of GEORGIA.**—Vessels bound from New Westminster or Vancouver to Nanaimo, with a strong head wind and flood tide, usually steam through Portier Pass (see Addenda for page 385), and then to the northward by the inner passages. With a light or fair wind, they pass northward of Gabriola Island.

Buoys and beacons in this strait are not to be relied on, as they are liable to be swept away by the strong tidal streams.

Page 459.—**ROBERTS BANK** is marked by a pile *beacon*, surmounted by a conical framework, reaching 12 ft. above high water, standing on the S.W. edge of the bank, at $3\frac{1}{4}$ miles S.E. $\frac{1}{4}$ E. from the lighthouse.

Pages 459-463.—**FRASER RIVER** entrance is liable to alterations, but the buoys marking it are shifted when changes occur. The present and only entrance fit for large vessels is $1\frac{3}{4}$ mile north-westward of the lighthouse, and attempts are being made to render this permanent by means of training-walls and dams. Of recent years it has increased in depth, so that a steamer loaded to 24 ft. has been able to leave the river.

The principal salmon canneries are at *Steveston*, on the North bank, half a mile above Garry Point, and here large vessels can lie alongside the wharves, or moor out in the stream. The least depth in the approach is about 12 ft. at low water, and 20 to 24 ft. at high water springs. The chief salmon fishery lasts from the beginning of July to the middle of August.

Strangers must not attempt to enter without the aid of a pilot, who may be obtained from Skunk Cove (Burrard Inlet) or from Victoria. The charge in or out is 4 dollars per foot of draught for sailing vessels, 2 dollars per foot if towed, and $1\frac{1}{2}$ dollar per foot for steamers.

Capt. C. Meyer, of the German ship *Adelaide*, says it is advisable for a sailing ship bound hither to hire a steam-tug at Victoria. A pilot also should be obtained there, to prevent delay. As much ballast as possible should be thrown over before entering, to save the expense of lightering. He also considered it inadvisable for a vessel drawing over 18 ft. to go higher up the river than Steveston, but those drawing 14 ft. can easily reach Langley.—(*Der Pilote*, Heft 3, 1902).

Page 462.—**Sand Head Lighthouse,** on the S.W. part of Sturgeon Bank, was in lat. 49° $5\frac{1}{2}'$ N., long. 123° 17′ 20″ W., but the light and *Fog Bell* are now discontinued.

At 7¼ cables S.W. by W. from the lighthouse, in 9 ft. water, is a black pile *beacon*, bearing a *ball* 6 ft. in diameter, rising 12 ft. above high water. At 1 cable West of it the depth is 13 fathoms, increasing rapidly to 20 and 30 fathoms.

SAND HEADS Lightvessel, established in October, 1905, marks the entrance of the main channel into the river, and lies in deep water about 4½ miles S. 58° W. from Garry Point light. It is painted red, with two masts 29 ft. apart, and shows on each a *fixed bright* lantern light, elevated 56 ft., and visible 13 miles. In foggy weather, a *Bell* is struck *once* every 10 *seconds*.

Beacon Lights.—*South Curve* lighthouse is a small white building on piles, on the South side of the main channel into Fraser River, at about 3⅛ miles S.W. ⅜ S. from Garry Point light. *North Dam* lighthouse, a similar structure, stands on the North side of the channel, over 1½ mile W. by S. ½ S. from Garry Point light. Each shows an unattended *fixed* light, elevated 22 ft., *red* during the fishing season from July 1 to September 30, and *bright* during the remainder of the year. These structures are moved to suit changes in the channel.

Garry Point Light.—A *fixed red* light, elevated 22 ft., and visible 6 miles, is shown for fishing vessels at the tide-guage house, 1½ cable westward of the point. The tree on the point no longer exists.

Buoys.—A *red Bell buoy* lies in 15 fathoms, off the western extreme of Roberts Bank, about 1 mile S.S.E. from Sand Heads lightvessel, and 2¼ cables N.W. ½ W. from the black beacon on the bank. The entrance is marked by two *buoys :* one, painted *red*, lies about 1¾ mile N.W. ½ N. from the site of Sand Head lighthouse; and the other, painted *black*, lies about 2 cables farther northward. Within these the channel is marked by *red* buoys to starboard, and *black* buoys to port, in entering. A *beacon* stands on the East side of *Westham Island*, 2¼ miles within Garry Point, and a *spar* buoy marks *Woodward Slough*, eastward of the beacon.

South Channel, or *Canoe Pass*, with 4 to 8 ft. water in it, can only be used by small vessels, with local knowledge. Its entrance is close southward of the beacon on Roberts Bank, within which the channel is marked by pile beacons and spar buoys.

Pages 462-463.—**Directions** given cannot be relied on, owing to changes. As before stated, strangers must not attempt to enter without the aid of a pilot.

Tides.—It is high water at the river entrance, on full and change, at 5h., but the tides are irregular, as before explained (see Addenda for page 322). At New Westminster, high water occurs from 30m. to 40m. later, and low water from 30m. to 2½h. later, than at the entrance; in September, 1890, the ebb here ran 3 to 4 knots, and the flood 1 to 1½ knot, the water being quite fresh.

Page 463.—**NEW WESTMINSTER** contained 6,499 inhabitants at the census in 1901. It is situated on a branch of the Canadian Pacific Railway, and there is also communication with Vancouver, 12 miles distant, by electric tramway. A railway bridge crosses the river to *Liverpool*, which is connected by railway with Seattle, &c. Vessels which can reach Steveston can also ascend the river to New Westminster, where they lie moored, in 6½ to 7 fathoms, sand and mud. Here the river is usually frozen over from January to the beginning of March; and in July and August, navigation is hindered by the floods and drifting timber. Supplies of all sorts, including coal, can be obtained here, and small repairs could be executed at the foundries.

Page 464.—**North Fork,** the northernmost approach to Fraser River, is nearly dry at low water, and only navigable by small craft, with local knowledge. It is marked by single pile *beacons*, the outermost being in lat. 49° 14′ N., long. 123° 13¾′ W., outside which the channel is lost in the sands of Sturgeon Bank.

Lights.—An unattended *fixed bright* light, elevated 20 ft., and visible 9 miles, is shown from each of two white turrets on piles, standing respectively 1 mile S. 56° E., and over 2½ miles S. 74° E., from Point No Point.

Pages 464-465.—**BURRARD INLET** has become the most important harbour on the coast of British Columbia, since the completion of the Canadian Pacific Railway, a distance of 2,906 miles from Montreal. Pilot vessels usually cruise off the entrance, but they sometimes lie at anchor near Spanish Bank, or in Skunk Cove, half a mile eastward of Atkinson Point. Sailing vessels pay 3 dollars per foot of their draught for pilotage; vessels in tow, 2 dollars per foot; and steamers, 1½ dollar per foot. Steam-tugs are available.

Page 465.—**Atkinson Point Lighthouse** is 41 ft. high; the light is elevated 95 ft., and is obscured when bearing eastward of N. 71° E. In foggy weather, a *Horn* sounds a blast of 8 *seconds*, separated by intervals of 1 *minute*.

A *red Bell buoy* lies 1¼ mile N. 27° W. from Grey Point.

Pages 465-466.—**English Bay** is now in railway communication with the city of Vancouver, being a seaside resort. *Spanish Bank* is not easily made out when covered; its northern edge, about 2½ miles S.E. ¼ S. from Atkinson Point lighthouse, is marked by a pile *beacon*, bearing a red ball 10 ft. above high water, at 100 yards northward of which the depth is 8 fathoms. The *buoy* lies in 10 fathoms. The telegraph cable from Vancouver Island is landed at a white hut on the North side of the bay; from this hut it trends 1⅔ mile to W. by S., and then S.W., passing 3½ cables North of Spanish Bank beacon. Vessels must carefully avoid fouling it when anchoring.

It is high water in English Bay, on full and change, at 7h.; ordinary springs rise 13 feet, neaps 11 feet. In winter, or from September to March, the tide is high during the day (the ebb then running only 3 or 4 hours), and low during the night (the ebb then running 7 to 9 hours). In summer this is reversed, being low during the day and high at night. The tides are very complicated, and can only be depended on at full and change.

Page 466.—**First Narrows,** or *Lion's Gate.*—The channel is only 1 cable wide in the narrowest part, with depths of 6 to 12 fathoms. When the tides are running strongly, eddies are met with here, needing great caution, especially in vessels of deep draught. The edge of the drying flat on its North side is marked by pile *beacons*, two of which mark the position of the water-pipes which here cross the Narrows. A *red* spar *buoy* lies in 3 fathoms, on the South side of the channel, at 4 cables W. ¼ N. from Brockton Point lighthouse.

Prospect Point Lighthouse, below the bluff, is a square white building 31 ft. high, showing a *fixed bright* light, elevated 28 ft., and visible 10 miles westward between S. 64° W. and S. 70° E.; it is thus obscured over the dangers on the South side of the channel. In foggy weather a *Bell* is struck *once* every 20 *seconds.*

Brockton Point Lighthouse is a wooden building 29 ft. high, near the *Signal Station*, and is painted brown and yellow, with a red roof. The light is *fixed*, elevated 42 ft., and visible 8 miles; it is *bright*, with a *red* sector of 24° over Burnaby Shoal, between N. 83° E. and S. 73° E. In foggy weather, a *Bell* is struck *once* every 20 *seconds.*

Parthia Shoal, with 21 ft. least water, is 3¼ cables in extent, East and West, within the 5-fathoms line, and the eastern edge lies 2½ cables N.W. ½ W. from the eastern extreme of Brockton Point. Two mast *beacons*, each bearing a *white drum*, stand on the South shore, to show its eastern and western limits. A 25-ft. bank lies 1 cable north-eastward of the shoal. Large vessels pass southward of them.

Pages 466-467.—**VANCOUVER HARBOUR,** formerly known as *Coal Harbour*, is spacious and landlocked, and easily accessible to vessels of the largest size. The Canadian Pacific Railway was completed in 1887, and there are now lines of steamers running to China and Japan, Australia, Alaska, and the various coast ports. It is calculated that by this route the distance from England to Yokohama is shorter by 1,026 miles than by way of San Francisco.

VANCOUVER, occupying the southern shore of the harbour, contained 26,133 inhabitants at the census in 1901, and is rapidly growing in importance. It is fronted by substantial wharves, with depths of 24 to 27 ft. alongside, provided with spacious sheds, and connected with the railway. In addition to the railway traffic, a large trade is carried on in timber, there being extensive sawmills in the vicinity. Provisions and supplies are plentiful, including coal and water, the latter being obtained from Capilano Creek, on the North shore of the First Narrows, the pipes passing across on the bottom. At Cedar Cove, about a mile eastward of Hastings sawmills, is a patent slip, capable of raising vessels up to 1,500 tons, and minor repairs can be executed for vessels and their machinery. Vessels can also be safely beached on the North side of the harbour.

Time Signal.—A gun is fired, on the South side of Brockton Point, at 9h. p.m., Pacific standard mean time (long. 120° W.), equivalent to 5h. a.m., G.M.T.

A good mark for anchoring, in the western part of the harbour, is the conspicuous square tower (with a short steeple) of a church, the largest building in the western part of the town.

Compass Beacons.—Near the Siwash mission, on the North side of Vancouver Harbour, are two mast beacons, painted in red and white bands, and bearing a white triangle with a central black line. They are 334 yards apart, and in line bear *N. 29° E.*, true.*

* In 1902, the magnetic bearing was N. 6° E., but observations show a rapid increase in recent years. In 1891, the variation was 23° 25′ E.; in 1897, it was about 25°; and in 1901, it was 27° E. on Deadman Island, in the harbour.

Page 467.—In entering Vancouver Harbour, keep the South shore of First Narrows aboard within $1\frac{1}{4}$ cable, when past the narrowest part, until abreast Brockton Point.

Burnaby Shoal is about 2 cables in extent, with 9 ft. over it, lying $3\frac{1}{4}$ cables E. $\frac{1}{4}$ N. from Brockton Point. A *red* spar *buoy*, in 12 ft., marks its N.E. side. A good mark, to lead eastward of it to the anchorage, is the centre of the prominent railway station in line with the tall thin spire of a church in the eastern part of the city, bearing South.

The best anchorage is in 6 to 8 fathoms, in the S.W. angle of the harbour, between Brockton Point and the railway wharf.

Tides.—From observations at Vancouver, in April, May, and June, it was found to be high water, on full and change, at 7h.; springs rise 13 ft., and neaps 11 feet. The streams in the Narrows turn at high and low water by the shore. There is a large diurnal inequality. In summer, the higher tides occur at night, and in winter during the day.

Second Narrows.—The navigable channel varies from $1\frac{1}{2}$ to 2 cables in width, with depths of 10 to 20 fathoms. A telegraph cable is laid across its narrowest part, its direction being marked by three posts on the northern mud-flat.

Pages 467-468.—**Port Moody** contained only 539 inhabitants in 1901, and the wharf is now in ruins.

Page 468.—**GABRIOLA REEFS.**—The iron *beacon* has disappeared, and a square black stone *beacon*, with staff and ball rising 22 ft. above high water, has been built on *Thrasher Rock*; it should not be approached within 1 cable. The *buoy* has been removed. A 3-fathoms rock lies nearly $1\frac{1}{3}$ mile South, and a 4-ft. rock at $2\frac{1}{4}$ miles S. 15° W., respectively, from the beacon.

Page 469.—**Flat Top Islets.**—At $1\frac{1}{2}$ cable off the East point of Flat Top Islet is a rock rising 2 ft. above high water, at 150 yards E. $\frac{3}{4}$ S. from which is a sunken 5-ft. rock, marked by kelp.

Entrance Island has rocky shoals, of 7 to 11 fathoms, extending $1\frac{3}{4}$ mile E.N.E. from it. There is a rock nearly in the middle of *Forwood Channel.*

The Light on Entrance Island now shows *red* over Gabriola Reefs, between East and S. 83° E. (7°). In foggy weather, a *Horn* sounds a blast of 8 *seconds*, with intervals of 45 *seconds.*

Lighthouse or *Snake Island* is about 39 ft. high, and the ledge E.S.E. of it has only 7 ft. over its northern edge. A *red can buoy* lies in 9 fathoms, about 1 cable south-eastward of the South end of the ledge.

Page 470.—**Sharp Point.**—Shoal water extends $1\frac{1}{2}$ cable westward and north-westward from the extremity of this point, which should be given a wide berth, as the tides sometimes set strongly past it. Sharp or Jack Point is the low extremity of a narrow wooded peninsula, and about 1 cable within it are a white cottage and other farm buildings. At 1 mile farther South is another white cottage.

Vessels should not anchor in the fairway of Nanaimo Harbour entrance. Those of deep draught can lie in 24 fathoms, mud, $4\frac{1}{2}$ cables W.S.W. of Sharp Point; or small vessels can anchor in 13 fathoms, 1 cable farther to W.S.W.

Pages 470-471.—**NANAIMO HARBOUR**, formed between Protection and Newcastle Islands and the main, is safe and commodious, and is accessible to vessels of the largest size, but the navigable entrance is only about 150 yards wide.

Protection Island is 8 cables in extent, North and South, thickly wooded except at its northern and southern ends, the trees rising to 200 ft. above high water. It is surrounded by drying rocky ledges, reaching from 70 to 170 yards off. On its northern end are some farm buildings, and on its South side is a colliery,* the refuse from which has been heaped over the rocky ledges southward of *Gallows Point.* The loading wharf is 665 feet long, and vessels can lie alongside the coal shoots at any time of tide, the depths varying from 22 to 34 ft. at low water, but in 1902 a rock was found, with only 17 ft. over it, at 45 ft. S.E. $\frac{1}{4}$ E. from the South extremity, and several vessels have touched on it.

Newcastle Island is $1\frac{3}{4}$ mile in length, N.W. and S.E., and is separated from the North side of Protection Island by a channel 1 cable wide, drying 5 ft. at low water. It is well wooded, the trees rising to 250 ft. above high water. On its South end are some farm buildings, and a small pier.

Within these islands, the harbour is encumbered by several sunken dangers, marked by buoys and beacons.

* The workings extend about 3 miles under the sea, the seams lying from 600 to 700 ft. below the surface.

Middle Bank consists of rock covered with mud and boulders, having only 2 to 3 ft. over them at low water. Its North end is marked by a *black* pile *beacon*, bearing a small *fixed bright light*, elevated 10 feet. Two *red* spar *buoys* mark its western side, and at its South extreme is *red buoy* No. 4, a platform carrying a pyramid surmounted by a ball.

Satellite Reef, drying 4 ft., lies northward of Middle Bank, and shoal water extends $1\frac{1}{4}$ cable north-eastward and south-eastward of it. At its southern end is *red buoy* No. 6, similar to that on Middle Bank. Two small 3-fathoms patches lie off the S.W. side of the reef.

Beacon Rock dries 4 ft. at low tide, 1 cable off shore, North of the steamer wharves. On its South part stands a round stone *beacon*, upper part *white* and lower part *black*, surmounted by a staff and ball, 22 ft. high.

Carpenter Rock, with 2 ft. over it, lies 1 cable off shore, near Millstone Creek, and is marked by a platform *buoy*, carrying a black pyramid surmounted by a white ball.

Passage Rock, with 5 ft. over it, lies on the eastern edge of the mud bank forming the western side of Newcastle Island Passage, the navigable channel here being only 50 yards wide. It is marked by a *black* platform *buoy*, carrying a pyramid surmounted by a triangle.

The shoal water reaching off *Gallows Point* is marked by *red buoy* No. 2, a platform carrying a pyramid surmounted by a ball.

The North extreme of the mud bank on the South side of the entrance, opposite Gallows Point, is marked by *black buoy* No. 1, a platform bearing a pyramid surmounted by a triangle base upwards. Within this, the edge of the bank is marked by two similar buoys.

NANAIMO contained 6,130 inhabitants at the census in 1901, and is connected with Victoria, 73 miles distant, by railway, and with Vancouver and other coast ports by regular lines of steamers. The output of coal at Nanaimo and Departure Bay amounted to 1,023,013 tons in 1904. Great improvements have been made in the wharves and shipping facilities, so that at Nanaimo three steamers of 6,000 tons capacity can lie alongside at once, and could be loaded at the rate of 10,000 tons in 24 hours. The price is about $3\frac{1}{2}$ dollars a ton. The town wharves have depths of 20 to 29 ft. alongside; to the north-westward of these is the ballast wharf, close off which is *Nicol Rock* (at $1\frac{1}{2}$ cable E.S.E. from Beacon Rock) which has been dredged to a depth of 16 ft. at low water. The wharves for the Vancouver and Comox ferry steamers are in the bight westward of this.

The town occupies the western shore of the harbour, the land sloping to an elevation of 230 ft., and along the summit are several prominent buildings, the southernmost being the old blockhouse of the Hudson Bay Co., re-erected here as a landmark. At its N.W. end is *Millstone Creek*, where are some large sawmills. Beyond this the land is lower, and occupied by the town of *Newcastle*, and farther on are the conspicuous prison buildings.

Supplies of all kinds, including fresh meat and stores, can be obtained here, and good fresh water is brought down to the wharves. Only small repairs could be executed here, but vessels can be safely beached, if necessary. The hospital will admit seamen.

Lights.—A *fixed red* light, elevated 18 ft., and visible 3 miles, is shown from a small white pile lighthouse in 6 feet water, on the South side of the harbour entrance, at $2\frac{1}{2}$ cables S. 40° E. from the flagstaff on the wharf northward of Gallows Point.

A *red* light is shown on the northern angle of the steamer wharf, and a *green* light on the southern angle.

Tides.—It is high water in Nanaimo Harbour, on full and change, at 5h., but the tides are irregular, as mentioned at other places on this coast. The extreme range is about 14 feet.

Pilotage is compulsory for vessels entering the harbour, the charge being 3 dollars per foot of draught for sailing vessels, and 2 dollars per foot for steamers or vessels in tow. The pilot station for Nanaimo, Departure Bay, and Baynes Sound is at Rocky Point Cove 2 miles westward of Entrance Island.

Directions.—Care is necessary in entering, as the tidal streams sometimes run strongly. After passing Sharp Point, at a distance of not less than 2 cables, steer midway between the buoys off Gallows Point, whence there are two channels to the wharves or anchorage. *North Channel*, northward of Middle Bank, has at least 6 fathoms in it at low water; *South Channel*, southward of that bank, has a least depth of 31 ft. in the fairway, and the bank on the South side is being dredged to 30 feet. Vessels loading at the Nanaimo coal wharf usually enter by North Channel and leave

by South Channel, the vessel's head thus facing the prevailing S.E. wind when lying alongside the wharf.

The best anchorage is in 5 fathoms, at $1\frac{1}{4}$ cable N.E. $\frac{1}{2}$ E. from Beacon Rock; or vessels can lie in $4\frac{1}{2}$ fathoms, about $1\frac{1}{2}$ cable westward of the 3-fathoms patches.

Pages 471-472.—**DEPARTURE BAY.**—An overhead telephone wire crosses the channel between Newcastle Island and the Vancouver shore, at an elevation of about 100 feet. *Passage Rock*, with its *buoy*, is described previously. The tides do not run very strongly in this passage, the flood setting northward, and ebb southward.

The coal-mining town of *Wellington* is connected with Nanaimo by railway, and now contains about 2,000 inhabitants. The wharves have depths of 4 to 6 fathoms alongside. Fresh water can be obtained here, and vessels can be safely beached, if necessary. A telegraph cable from the mainland is landed inside Black Rocks.

Captain Walbran, of the government steamer *Quadra*, states that the passage to and from the wharves, between Double Island and Black Rocks, is perfectly safe and free from danger. The passage northward of Black Rocks and Jesse Island is also good and safe, care being taken to avoid a 2-fathoms patch lying about 100 yards eastward of the easternmost Black Rock. Depths of 7 and 8 fathoms are found close along the North shore of Double Island and Jesse Island. At 1 cable off the East end of the easternmost Double Island is a depth of 2 fathoms, marked by kelp.

A rock, with 2 ft. over it at low water, and steep-to, lies between Jesse Island and Horsewell Bluff, with the latter bearing N. by W., and the western bluff of Jesse Island S.W. by S.

Buoyage.—*Clarke Rock*, nearly in the centre of *Inner Channel*, and drying 4 ft. at low water, is marked by a *red spar* buoy on its eastern edge. Another buoy marks the eastern side of the entrance of Inner Channel.

In 1904, the following buoys were also stated to exist:—A *red* buoy, with staff and *ball*, marking the reef off Newcastle Island, on the S.E. side of the bay. A *red can* on the edge of the shoal on the North shore, inside Black Rocks. A *black can* eastward of the reef off Jesse Island. A *red can* off Horsewell Bluff reef.

Page 472.—A 3-fathoms patch lies off the N.E. side of Newcastle Island, at $5\frac{1}{2}$ cables E. by N. $\frac{1}{4}$ N. from McKay Point. Off Hammond Bay, about 3 miles north-westward of this, is a 5-fathoms shoal, at $5\frac{1}{4}$ cables N. 38° W. from Lagoon Head, with another patch of 5 fathoms at $2\frac{1}{2}$ cables S. 73° E. from it. Several 3-fathoms patches lie in the channel between Five Finger Islands and West Rocks, which should not be used.

Hammond Bay, being open to the swell, is not recommended as an anchorage.

Page 473.—*Tides.*—These are irregular at Burrard Inlet, as at Nanaimo, etc.

Page 473.—**Northumberland Channel.**—*False Narrows* are intricate and dangerous, with a depth of about 3 fathoms at high water. The channel is marked by three single pile *beacons*, and three *spar buoys*.

Page 474.—**NANOOSE HARBOUR.**—Supplies of fresh beef can readily be had here. In 1903, the officers of H.M.S. *Egeria* reported a $4\frac{1}{2}$-fathoms rock at 6 cables N.E. $\frac{1}{4}$ E. from the eastern end of Maude Island, and a bank of 10 fathoms extends $5\frac{1}{2}$ cables E. by S. from this rock. A 6-ft. rocky patch lies in the entrance of Nanoose Harbour, at 2 cables N. $\frac{2}{3}$ W. from the eastern extreme of Entrance Rock. A 5-fathoms rock lies about 2 cables E. by N. $\frac{1}{2}$ N. from the 6-ft. rock. In entering, do not approach Entrance Rock within $2\frac{1}{2}$ cables.

Vessels should not attempt to pass between *Winchelsea Islands* and the shore. *Grey Rock* is reported to be awash at high water springs. *Rudder Reef* is awash at lowest tide.

Pages 474-475.—**BALLINAC ISLANDS Lighthouse**, built on the S.E. part of the eastern island, is a square white building 33 ft. high, showing a *fixed bright* light, elevated 100 ft., and visible 16 miles, but it may be obscured at intervals by trees northward between N. 75° W. and N. 26° E. In foggy weather, a vessel's signals will be answered by a hand *Horn*.

Page 475.—**Ballinac Channel.**—In 1901, the steamer *City of Nanaimo* touched on a rock, now named *Dorcas Rock*, lying $3\frac{3}{4}$ cables N.W. $\frac{1}{2}$ W. from Dorcas Point. It has depths of 4 to 16 ft. over it, with kelp on it, and was marked by a *black spar buoy* in 4 fathoms on its northern edge. The ebb here was found to set strongly W.N.W.

In 1904, the officers of H.M.S. *Egeria* found an isolated rock, with 15 ft. over it, and 20 to 40 fathoms close around, at 4 cables N. $\frac{1}{8}$ E. from the centre of Douglas Island, with Ballinac Islands lighthouse bearing N.W. by N. $\frac{3}{4}$ N., distant 11 cables.

North-West Bay is reported to afford good shelter from S.E. winds, and the settlers say that strong north-westers do not blow home. On the West side of the N.W. point

is *Beaver Creek* wharf, where the farmers ship their produce. At 9 miles westward of this bay is *Parksville*, at the mouth of *Little Qualicum River*.

Qualicum River.—A *black can buoy* lies in 5 fathoms, about one-third of a mile northward of the entrance.

Between Qualicum Bay and Yellow Island, vessels may approach the shore to 1 mile, and find anchorage, over mud bottom, in not less than 15 fathoms. The depth decreases rapidly from 10 fathoms as the entrance of Baynes Sound is approached.

Denman Island is 10 miles long, and 535 ft. high.

Page 476. –**Hornby Island** is about 4 miles in extent. Both these islands are thickly wooded, and now partly occupied by farms.

Yellow Island, connected with the S.E. point of Denman Island by a shallow ridge, is steep and bare, about 50 ft. high.

Lights.—On the East extreme of Yellow Island is a square white wooden building, 28 feet high, showing a *fixed bright* light, elevated 68 ft., and visible 13 miles in all directions, except where obscured by trees and the high land of Denman and Hornby Islands. At 97 yards S. 74° W. from this is a white wooden building 18 ft. high, showing a *fixed bright* light, elevated 46 ft., and only visible towards the entrance of Baynes Sound. In line, bearing N. 74° E., they lead through it, in not less than 7 fathoms, between Reef Point buoy and Maple Spit.

BAYNES SOUND is 16 miles in extent, varying from three-quarters of a mile to 2 miles in width, and accessible to vessels of the largest size. It is frequented by vessels loading coal at the Union Collieries wharf, and there are artillery and rifle ranges for H.M. ships. Kelp Bar, the northern approach, has 10 ft. over it at low water. The buoyage is now on the Uniform System (see Addenda for page 351), *red* to starboard and *black* to port, in entering. The magnetic variation is reported to be rapidly increasing here, observations in 1897 showing an increase of $2\frac{1}{2}°$ above that then given on the chart.

Maple Point has a solitary clump of high bushes near the centre of the narrow grassy tongue forming its extremity. A spit of sand and shingle dries for one-third of a mile northward from the point, and about 1 cable off its N.E. edge, in 6 ft. at lowest tide, stands a *black beacon*, bearing two round white discs at right angles, rising 15 ft. above high water. Shoal water extends 3 cables E.N.E. from this beacon, and then trends about $7\frac{1}{2}$ cables East. Vessels should not approach Maple Point, or the shore for 2 miles eastward of it, within three-quarters of a mile, as the depth here decreases very rapidly from 10 to 2 fathoms.

For $2\frac{3}{4}$ miles from Yellow Island the southern shore of Denman Island consists of earth slopes and cliffs, fronted by reefs, which gradually increase in width towards *Reef Point*, a red cliff 2 miles W. by S. from Yellow Island, and reducing the navigable channel to $2\frac{1}{2}$ cables in width. A *conical red buoy*, bearing a triangle, lies in 5 fathoms, off the extremity of the rocky ledge drying 3 cables off Reef Point, and a similar buoy lies in 8 fathoms, 3 cables off shore, at $5\frac{1}{2}$ cables West of Reef Point. The tidal streams sometimes run 2 to 3 knots in this locality.

Directions.—In entering Baynes Sound by the southern approach, steer W. by N. for Yellow Island, and, rounding it, steer so as to bring the lighthouses in line astern, and keeping them so the vessel will pass through the channel between the beacon off Maple Point and the buoys off Denman Island.

Deep Bay affords sheltered and convenient anchorage for vessels of any size. The shore hereabout is low and swampy, fronted by shoal water. At $1\frac{1}{2}$ mile westward of the bay, the coast forms a bight drying at low water, and is fronted by dangerous reefs as far as *Ship Peninsula*, which is conspicuous by the high dark trees on it.

Page 477.—*Base Flat*, the low western point of Fanny Bay, is surrounded by a shallow bank reaching $2\frac{1}{2}$ cables off, and marked on its outer edge by a *beacon* similar to that off Maple Point. The shoal continues quite half a mile south-eastward of the beacon.

Village Point has a sandspit and drying rocky ledges extending $1\frac{1}{2}$ cable off, the N.W. extremity being marked by a *conical red buoy*. There is anchorage northward of the spit, and a wharf at the village of *Quadra*.

UNION WHARF, 5 miles north-westward of Base Flat, is the loading place for the good steam coal and coke brought down by railway from the Comox mines near the town of *Union* or *Cumberland*, a distance of 13 miles. The wharf reaches into 6 fathoms at low water, and vessels of any size can lie alongside. There is anchorage off its South end, in 10 or 11 fathoms, mud, near the hauling-off buoy. Fresh water is laid on to the wharf, and fresh provisions can be obtained from the town.

Union Point, northward of the wharf, has a spit drying off it, the extremity being marked by a *black beacon* pile with ball, in 18 ft., and rising 10 ft. above high water.

Beak Point is low and sandy. *Sandy Island* has a conspicuous clump of trees on it, and this, and the other bare islets, are used for the artillery targets; three *red* spar *buoys*, marking the firing line, lie about 6 cables westward of Sandy Island.

Kelp Bar shoals rapidly from 20 fathoms on either side, and has 10 ft. in the channel over it at low water; the tide rises about 12 feet. Two *red* spar *buoys*, 5 cables apart, mark the crossing, and vessels will pass about 100 yards eastward of them by keeping the two St. Andrew's cross beacons on White Beach in line. A *red bell buoy* lies in 25 fathoms, 5½ cables outside the outer buoy, and from it the beacon on Goose Spit bears S.W. by W. ¾ W., distant 2¾ miles.

Page 478.—**Port Augusta.**—Within Goose Spit is the village of *Comox*, with a long wooden pier reaching into 14 ft. at low water, where the produce of the surrounding farms is shipped. Petroleum has been found in the vicinity. Within the limits of the port, ships' compasses have been affected by some local disturbance, about 2½° in excess of the variation outside.

Goose Spit will be easily made out by the buildings attached to the rifle range on it. On its S.W. end is a wooden pyramid *beacon*, bearing a triangle base upwards, 32 ft. high, and painted white above and black below.

A black pile *beacon*, bearing a drum, stands in 15 ft. water, near the N.E. extremity of the flat extending from *Grassy Point*.

Pages 478-479.—**Lambert Channel.**—Here the tidal streams sometimes run 2 knots an hour, flood coming from the S.E.

From *Norman Point*, the South point of Hornby Island, reefs extend for nearly 4 cables, leaving only a narrow passage between them and *Norris Rock*, which rises 10 feet above high water. At half a mile N.W. of Hornby Point is a pier reaching into 6 ft. at low water, eastward of the southern end of a detached reef, which lies 1½ cable off shore. A *black* spar *buoy* lies in 3 fathoms, close southward of this reef, and 1½ mile N. by W. ¾ W. from Yellow Island eastern lighthouse.

Page 479.—Good sheltered anchorage is found northward of *Shingle Spit*. Shoal water extends for nearly a mile W.N.W. of *Boulder Point*, the N.W. point of Hornby Island. *St. John Point* now has a few trees on it. *Nash Bank* partly uncovers at low water.

CAPE LAZO is about 200 ft. high, and fronted by extensive drying ledges with large boulders. From it shoal water extends 3 miles E.S.E., and 1½ mile E.N.E.

Mittlenatch Island is reported to have shoal water extending about half a mile northward of it. At over 2 miles S. 30° E. from its summit is *Sentry Shoal*, with 5 fathoms least water, 1½ mile in extent, N.W. and S.E., within the 10-fathoms line.

Page 480.—**Oyster Bay.**—*Kuhushan Point* is very low at its extremity, the trees being 300 yards within.

CAPE MUDGE.—The cliff rises to an elevation of 230 ft., and the boulder beach dries 4 cables off it. A stony reef extends eastward from it, patches of 4 and 5 fathoms being found at 1½ mile from its southern extreme. The first of the flood sets strongly eastward over this reef, sometimes causing a dangerous race, often extending across the entrance of Discovery Passage.

The Lighthouse on Cape Mudge is a square white wooden dwelling 30 ft. high, with a red roof, standing on the western extreme of the cape; it shows a *fixed bright* light, elevated 32 ft., and visible 10 miles southward between S. 73° E. and N. 48° W.

Pages 480-481.—**Sisters Rocks** are three in number, and rise 17 ft. above high water, the easternmost and largest having a lighthouse on it. An isolated sunken 10-ft. rock lies 1 cable N.E. of the lighthouse; and another, drying 1 foot, lies 1¾ cable S.W. by S. ½ S. from the lighthouse.

The Lighthouse is a square white dwelling surmounted by a tower, the whole 36 ft. high, showing an *occulting bright* light, visible 20 *seconds* and then eclipsed 10 *seconds*, elevated 46 ft., and visible 12 miles. In foggy weather, a *Bell* is struck *once* every 30 *seconds*.

Pages 481-482.—**HOWE SOUND.**—On the East side of the eastern mouth of *Squawmish River* is the village of *Squawmish*, with a pier reaching into 9 ft. water. The ground here is very soft, affording no hold during strong winds.

Bird Rock, and other rocks, lie close off the coast northward of Atkinson Point, and the steamers in the timber trade pass within to avoid strong tides. A dangerous pinnacle 8-ft. rock, however, lies midway between Bird Rock and Copper Point.

Pages 482-483.—**Shoal Channel** has depths of 7 to 18 ft. over the bar, the best water being found about 2 cables from the mainland shore. Two rocks, drying 3 ft. at low water, lie on the West side of the channel; the northern one, nearly 3 cables E. ¼ S.

from the extremity of the wharf at Gibson's Landing, is marked by a *black* stone *beacon*, bearing a *white ball*, rising 15 ft. above high water. A shallow rocky spit extends off shore below *Conspicuous Cone* (900 ft. high), and a rock awash at lowest springs lies 4¾ cables S.E. of this peak.

Page 483.—**Rock Point** is the point next westward of Gower Point, and a boulder reef extends half a mile off shore just eastward of it, its extremity being marked by a *red* spar *buoy*.

White Islet is 15 ft. high, and surmounted by a black wooden *beacon*, bearing a white turret, in which is shown an unattended *fixed bright light*, known as *Secchelt* light, elevated 36 ft., and visible 6 miles. A rock, dry at low water, lies 2½ cables off the mainland, N.E. ¼ N. from White Islet.

Halibut Bank, lying nearly in mid-channel of the Strait of Georgia, is about 1½ mile in extent, East and West, within the 20-fathoms line. It has a least depth of 12 fathoms, over hard sand and stone, near its western end, about 5 miles S.S.E. from White Islet.

Page 484.—**Trail Bay** affords anchorage in about 15 fathoms, off an Indian village with a conspicuous chapel, abreast a bluff in the N.E. angle. A rock, dry at low water, lies 2 cables off the coast, bearing N.W. from the rock off the North end of the western Trail Islet.

Thormanby Islands are about 500 ft. high, and a bank extends about a mile off the northern side of the western island. *Buccaneer Bay*, the northern part of the channel between them, extends over 1 mile S.E., and there is sheltered anchorage in 15 fathoms at its head. Shoal water extends half a mile from shore on each side of the entrance, the northern end of *Tattenham Ledge* (on the eastern side) being marked by a *red spar buoy*, in 4½ fathoms.

Welcome Pass, between Thormanby Islands and the coast, is deep but narrow. A detached rock, drying at lowest springs, lies in the South entrance, at 2 cables from the island shore. *Merry Island*, lying in mid-channel, is about 250 ft. high, with a deep channel on either side. A rock, drying 9 ft., lies westward of the fairway between Thormanby and Merry Islands, and 5¾ cables N.E. ⅓ E. from Bare Islet. To the E.N.E. of Merry Islet is the rounded *Welcome Point*, off which a shoal extends for 3 cables, marked by a *red spar buoy* in 6 fathoms.

The Lighthouse, on the S.E. end of Merry Islet, is a square white dwelling surmounted by a tower, 35 ft. high, showing a temporary *fixed bright* light, elevated 57 feet, and visible 6 miles.

TEXADA ISLAND.—Besides the valuable deposits of iron-ore on the S.W. side of the island, some deposits of gold, silver, and copper-ores are worked on the eastern coast. Copper-ore is now smelted at Van Anda.

Sturt Bay, on the North side of Texada, 3 miles from its N.W. extreme, is an inlet about 3½ cables deep, but its entrance channel is only 1 cable wide. Vessels come here for limestone, which is shipped from two piers.

Van Anda Cove, the bight next eastward of Sturt Bay, has a spit extending from its eastern point, marked by a small *beacon*. This place will be easily recognised by the copper-smelting works, and the adjacent settlement. The approaches to the wharf are clear of danger.

A *black* spar *buoy* lies in 6 fathoms, at 2 cables W.N.W. from the North point of *Texada Island*, to mark the shoal extending off it.

Page 485.—**MALASPINA STRAIT.**—In 1904, Capt. A. J. Bjerre, of the steamer *Active*, reported the existence of a sunken 12-ft. rock, in the northern approach to Welcome Pass, at 3¾ miles N.W. by W. ½ W. from Gowland Point.

Thormanby Islands.—See Addenda for page 484. The cliffs at the N.W. point are white and conspicuous.

Page 486.—**JERVIS INLET.**—In the entrance is *Granite Island*, on the South end of which are some quarries of grey granite.

Agamemnon Channel.—*Nile* or *Nelson Rock*, 1 mile S.W. by W. ½ W. from Fearney Point, is marked by a pyramidal *black* stone *beacon* 16 ft. high, bearing a *drum*, rising 26 ft. above high water.

Pender Harbour.—Several rocks have recently been found in the approaches, as shown on the chart.

Page 487.—Two rocks, of 3 and 4 fathoms, lie about 1¾ and 2¼ miles E. by S. of *Cape Cockburn*. Opposite the 3-fathoms or northern rock, which is 1¼ mile off shore, is a large white cross on a conspicuous boulder, which in line with a whitewashed tree trunk would lead over it.

Pages 487-488.—**Harwood Island**.—At 1 mile W.S.W. of the South end is *Bare Islet*, 30 ft. high. On the mainland, to the N.E. of Harwood Island, is the settlement named *Sliammon*, with a conspicuous chapel; the beach dries 2 cables off.

A *red* spar *buoy* lies in 5½ fathoms, off the western extremity of *Atrevida Reef*, extending off the mainland; from it Dinner Rock bears N. 75° W., distant 2¾ miles, and the West extreme of Harwood Island S. 22° E.

Vessels are recommended to avoid passing between Harwood and Savary Islands, as the ground is reported to be foul.

Page 488.—**Savary Island**.—A reef, half a mile in extent, W.N.W. and E.S.E., partly drying at low water, is reported to lie about 3 miles S. ½ W. from the S.E. extreme of the island. All the area within a line from Bare Islet towards the West point of Savary Island is said to be foul.

Lund is a settlement, with a post-office, on the coast south-eastward of *Ragged Islands*, in lat. 49° 59′ N.

Page 488.—**Hernando Island**.—A dangerous small rock, awash at low water, lies 150 yards N. ½ W. from the bluff of Hidalgo Point, on the North side of the island, with no safe passage between.

Page 489.—**Kinghorn Island**.—Some dangerous rocks lie off the N.W. side, the outermost being two drying at low water, and about 2 cables apart, half a mile northward of the island.

Page 490.—**CORTES ISLAND**.—The reef off *Reef Point* is said to extend farther than shown on the chart; a *red can buoy* lies in 14½ fathoms, close off its extremity.

Page 491.—*Mary Island* is from 90 to 120 ft. high; near the extremity of *Shark Spit*, extending northward from it, is a white pile *beacon*, rising 10 ft. above high water. Nearly midway between Shark Spit and Cortes Island, is a small rock, drying about 10 ft. at low water, and marked by a white iron spindle bearing a drum rising 3 ft. above high water; the usual channel, westward of the rock, is about 100 yards wide, with 6¾ fathoms in it.

Manson Bay, eastward of Mary Island, is clear of danger, and has a store and post-office at its head.

Whaleton Bay, on the West coast of Cortes Island, about 1 mile northward of Mary Island, affords good anchorage for small vessels in 5 fathoms, northward of a pole *beacon* on a rock near the head of the bay, on which a *light* is shown when the mail steamer is expected. Here is a small settlement, with a wharf and post-office. In the middle of the entrance is a small rock, with 8 ft. over it, and steep-to, marked by a *red* spar *buoy* on its North side.

Carrington Bay has very uneven bottom, and, in entering, vessels should keep in mid-channel, as shoal water extends 1½ cable from the southern shore.

Page 492.—**Calm Channel**.—On the S.W. side of the northern part is the entrance to *Hole-in-the-Wall*, which leads to *Okishollow Channel*, connected with Discovery Passage; these two channels are very narrow and encumbered with rocks, but small steamers use them to reach *Wyatt*, where timber is shipped.

Page 494.—**DISCOVERY PASSAGE**.—The tidal wave traverses this channel in about 3 hours, it being high water, on full and change, at Chatham Point at 2h.; at Seymour Narrows 3h. 30m.; and at Cape Mudge 5h. Northward of the Narrows the streams run from 1 to 3 knots an hour.

Approaching from the S.E. the entrance will be easily made out by Cape Mudge and its lighthouse (see the Addenda for page 480). Take care not to be set too far northward by the flood stream from the Strait of Georgia; nor over the bank off Cape Mudge by the flood from the North.

Page 495.—*Quathiasky Cove* has a small pier and a store in its S.E. angle.

Gowlland Harbour affords good landlocked anchorage at its southern end, in 9 to 10 fathoms, mud. The entrance channel is only 150 yards wide between Vigilant Islets (off the N.W. end of Gowlland Island) and *Entrance Rock*, with less than 6 ft. over it, off the S.E. extreme of Entrance Bank. The tidal streams run swiftly between Steep and Gowlland Islands, and across the entrance, so that caution is necessary. To enter, pass midway between Steep and May Islands, and by keeping the summit of Mouse Island just open northward of Vigilant Islets, the vessel will clear a 4-fathoms patch lying 1 cable W.N.W. of the western islet. Pass within half a cable of the islets to avoid Entrance Rock, and then steer to round *Spoil Rock*, of 3¾ fathoms, nearly 1 cable N.E. by E. ½ E. from the eastern islet, and proceed up the harbour to the anchorage. At times, the difference in height between two successive low waters amounts to as much as 9 feet.

At 3 miles N.W. of Willow Point, *Yaculta Bank*, with 6 to 9 fathoms over it, extends two-thirds of a mile from the western shore. A rocky 4¼-fathoms patch lies on it, nearly 1¼ mile S.W. by W. ½ W. from the centre of Yaculta village on the eastern shore, and is marked by kelp in summer.

Campbell River, 5½ miles from Willow Point, is navigable by canoes for several miles. *Orange Point* consists of low red earth cliffs, and a boulder bank extends 1 cable off its northern part. *Middle Point*, 1½ mile N.W. of Orange Point, is low and rocky, and at 1½ cable N.E. by E. from it is *Warspite Rock*, a dangerous pinnacle with only 4 ft. water over it. *Race Point*, 1½ mile farther on, is a bare rocky bluff 65 ft. high, past which the tidal streams set with great velocity, 9 or 10 knots at springs, the flood stream causing heavy overfalls and eddies, sometimes dangerous for boats.

Menzies Bay.—Vessels awaiting the tide to pass through Seymour Narrows will find convenient anchorage off Front River, in the southern part of the bay, in 5 to 6 fathoms. *Defender Shoal*, occupying the centre of the bay, is said to be extending; near the middle it dries 4 ft., and is marked by a small pole *beacon*. The channel northward of it has 5 fathoms, and there is sheltered anchorage within in 6 to 7 fathoms, mud and sand. The tides are subject to a large diurnal inequality.

Foul ground extends nearly 1 cable S.E. from *Stephenson Point*, the N.E. point of the bay. Eastward of it is *Nymphe Cove*, where good fresh water can be obtained.

Page 496.—**SEYMOUR NARROWS**.—*Ripple Rock* has a least depth of 2 fathoms, on its northern edge, at 2¼ cables W.S.W. from Maud Island. Its position will always be seen when the current is running, and is easily avoided by keeping along the eastern shore of the Narrows. There is no danger in passing through Seymour Narrows at the proper time, slack water or near thereto, but no vessel should attempt to pass when the tide is running strong. At springs the flood sometimes runs 12 knots, and the ebb 10 knots. Slack water usually lasts about 15 minutes at springs, the time of the turn of the stream depending greatly upon the range of the preceding tide. At springs, and after the greater range tides, it turns about 20 minutes after high or low water by the shore; at neaps, and after smaller range tides, at from 1 to 2½ hours after.

In 1894, the Canadian Government issued the following remarks:—The tides in the inland channels of British Columbia are affected by the winds, the highest tides occurring at certain times when neap tides are expected, at about the first and last quarters of the moon, so that no tide table can be depended upon with any degree of accuracy.

The rule governing the tides of the Pacific coast is applicable to all the inland channels of British Columbia; that is, there are usually two high and two low waters in each day, locally termed the long and the short run in or out. Owing to this peculiarity some difference of opinion exists as to the time of high water at Seymour Narrows, which may be explained thus:—It is high water, on full and change, of the short flood at 3h., and of the large or long flood at from 4h. to 5½h. Usually it is high water during the day in winter, and at night in summer. During May, June, and July, also in November, December, and January, there is only one real high and low water in each day, the water rising by the shore, while in the channels the stream runs ebb.

On four occasions in Seymour Narrows, at about full and change, in May and June, the water was observed to be perfectly still, and there is reason to believe that the slacks of the highest tide at this season continue for at least 30 minutes. As the time of high water approaches in Seymour Narrows, the flood tide runs comparatively smoothly from the North until it arrives off Maud Island, when the stream, deflected by the land to the southward, turns to the S.E., causing, unless close to slack water, most dangerous whirlpools and overfalls near the South shore of Maud Island, and also about 1½ mile farther on, near mid-stream, opposite to Race Point. With the ebb tide the stream runs comparatively smoothly from the South until again off Maud Island, where it turns to the northward through the Narrows, and becomes a rapid and dangerous race, with the water swirling in all directions. The tendency of the current is to keep a ship off the shore when passing through the Narrows.

Directions.—When going through the Narrows, bound North or South, ebb or flood tide, keep along the eastern shore, passing the S.W. point of Maud Island about 200 yards distant. When bound South, and going with the last of the flood, after passing the S.W. point of Maud Island, follow the main current well over to the South shore before turning eastward, and do not attempt to go round Maud Island closely, as just East of this point, on the flood tide, are the dangerous whirlpools previously mentioned.

Vessels waiting for slack water will find convenient anchorage in Duncan, Menzies, or Plumper Bays.

Plumper Bay has a rocky 14-ft. shoal near the edge of the shoal ground in its S.E. part.

Hole in the Wall, or *Okishollow Channel*, is the narrow passage northward of *Granite Point*, which thence extends across to the East coast of Valdes Island, one branch debouching opposite the entrance of Bute Inlet, and another runs into Hoskyn Inlet at Surge Narrows. It is frequented only by small steamers for lumber. The tidal streams here run 7 to 9 knots.

Page 497.—**Cardero Channel.**—Some rocks have recently been found in this channel, as shown on the chart. In *Shoal Bay* is a mining and timber settlement, with a wharf, post-office, and stores.

Elk Bay is $1\frac{1}{4}$ mile wide, and half a mile deep, affording fair anchorage in 15 fathoms, mud and sand, open to the North and East. Vessels entering *Otter Cove* pass midway between Limestone Island and two rocky islets $2\frac{1}{2}$ cables North of it, anchoring within in 6 to 12 fathoms, mud and sand.

Chatham Point is wooded, and foul ground extends one-third of a mile North and West from its East extreme. *Beaver Rock*, with 5 ft. over it, lies 2 cables N. W. by N. from the East extreme. A rock, with about 15 ft. over it, was reported to lie about 2 cables N. E. $\frac{1}{2}$ N. from Beaver Rock.

Page 498.—**JOHNSTONE STRAIT** has no anchorage along its southern shore, but several on the northern side, and both shores are thickly wooded. The time of tide varies between 2h. at Chatham Point and 0h. 30m. at the western end of the strait; springs rise 16 ft. at the latter, and 13 to 14 ft. at Chatham Point. Dangerous tide-rips are met with in the vicinities of Pender Islands, Knox Bay, Ripple Point, and Helmcken Island.

A rock, with less than 6 ft. over it, lies 1 cable off shore, at $1\frac{1}{2}$ mile westward of Chatham Point, and another, with 7 ft. over it, lies 1 mile farther on.

Thurlow Island is mountainous, and divided into two parts near its centre by the narrow *Mayne Passage*, which has not been surveyed. *Turn Island*, 200 ft. high, lies close off the South point, and at $1\frac{1}{2}$ cable S.E. of the S.W. point of Turn Island is *Siwash Rock*, with 6 ft. over it. *Pender Islands* are mostly wooded, and 325 ft. high to the tops of the trees; they should not be approached within 2 cables.

Ripple Point rises steeply to a peak 2,243 ft. high.

Page 499.—**Ripple Shoal** is about three-quarters of a mile long, East and West, with four pinnacle rocks on it, the least depth being 10 ft. over a rock near its centre, at $5\frac{1}{2}$ cables N. by E. from *Camp Point*. Unsuccessful attempts have been made to buoy it, the tidal streams running too strongly.

Salmon Bay is shallow, and *Salmon River* runs into it; at half a mile within the river is the Indian village of *Khusan*. At $1\frac{1}{4}$ mile eastward of the bay is an islet near the shore, and between is an indentation called *Port Khusan*, with a post-office.

Close northward of *Tyhee Point*, the S.W. extreme of Thurlow Island, is *Vere Cove*, easy of access, with good holding ground in 17 fathoms.

Helmcken Island is thickly wooded, 250 ft. high to the tops of the trees. *Speaker Rock*, drying 8 ft., lies $3\frac{1}{4}$ cables N.N.E. from its East point. The channels on either side of the island are clear, and each over half a mile wide, but the tidal streams run strongly through them, 6 knots at springs, causing dangerous eddies in blowing weather. Either channel may be used, as convenient, care being taken to avoid being carried towards Ripple Shoal with a strong West-going stream.

Fanny Islet, 2 cables W.N.W. of Clarence Islet (the western of the two islets off the West end of Hardwicke Island), is a flat rock about 3 ft. above high water, with a little vegetation on it. The ground between the islets is foul.

Blinkinsop Bay affords good anchorage in 6 to 10 fathoms, mud. Foul ground extends nearly 1 cable southward from *Tuna Point*, and a 5-ft. rock lies half a cable S.S.W. of it. Foul ground also extends 2 cables eastward from *Point George*, the western point of the bay, a boulder beach drying nearly 1 cable off it. *Blink Rock*, of 10 ft., lies $2\frac{1}{2}$ cables N.W. $\frac{1}{2}$ N. from Tuna Point; and *Elf Shoal*, of $3\frac{1}{4}$ fathoms, lies 4 cables S.W. $\frac{1}{4}$ W. from Block Islet, which lies near the N.E. shore of the bay. The 4-fathoms shoal, reported to lie 1 cable N.W. by W. from Tuna Point, does not exist.

PORT NEVILLE should only be entered with the aid of local knowledge. There is a post-office here. The best passage, on the West side of Passage Rock, has 15 ft. in it at low water, that to the eastward having 12 feet.

Page 500.—**Stimpson Reef** dries 9 ft. at springs.

It is high water in *Port Harvey*, on full and change, at 1h. 30m.; springs rise 16 ft., neaps 9 to 10 feet.

Escape Reef, 2 miles S. 66° W. from Broken Islands, is about 2 cables in extent, with 4 ft. over the eastern rock, and 12 ft. over the western.

Boughey Bay affords good sheltered anchorage, in 10 to 14 fathoms, mud. In 1902, the U.S. steamer *Grant* found refuge here during a S.E. gale, taking a mid-channel course to its head.

Page 501.—**Growler Cove**, 3 miles westward of Boat Harbour, runs nearly a mile to E.N.E., being about 1 cable in width, in its inner part, which affords landlocked anchorage in 5 to 8 fathoms, mud.

The tidal streams run from 3 to 5 knots through *Blackney Passage*, eastward of Hanson Island, causing a strong race off the West end of Cracroft Island.

Banza Cove, on the Vancouver shore, opposite the western end of Hanson Island, would afford anchorage for a small vessel, in 15 or 16 fathoms.

Page 503.—**Blunden Harbour** is not available for large vessels, and the entrance is tortuous. Several rocks have recently been found in its vicinity.

Page 504.—**BROUGHTON STRAIT.**—*Tides.*—The tidal streams do not exceed a rate of 3 knots at springs in the main channel, but in Race and Weynton Passages they run from 4 to 5 knots. There are also races and eddies off the projecting points during the strength of the stream. The streams turn at from 1½ to 2 hours after high and low water by the shore.

Beaver Cove would afford anchorage in 15 fathoms, for a small vessel, at the head of the western arm. *Mount Holdsworth* is 2,957 ft. high.

Nimpkish River.—Near the North edge of the bank, and 9 cables from the mouth o the river, is *Green Islet*, 4 ft. high. *Kish Rock*, with 5 ft. least water over it, lies 4 cables N. 60° W. from Green Islet. *Alert Rock*, of 3¾ fathoms, lies 5½ cables N. 40° W. from that islet.

Port McNeill.—A *red* spar *buoy* is placed in 6 fathoms, off the extremity of the ledge of Ledge Point; the least depth over the ledge is 6 ft., at 8 cables N. 73° E. from Ledge Point. *Neill Rock*, of 3¾ fathoms, lies north-westward of the ledge, and 1 mile S. 85° W. from the West end of Haddington Island. *Eel Reef* dries 10 ft., and lies 8 cables S. 12° W. from Ledge Point.

Race Passage is narrowed by *Gordon Rock*, drying at low water springs, in mid-channel; the navigable channel passes West of this rock, but it is not recommended. *Cormorant Island* is 400 ft. high to the tops of the trees, and its rocks belong to the coal measures. Ores of silver and copper are found on the adjacent *Pearse Islands*.

Alert Bay has a mission station, with a church, etc., a post-office, and a sawmill; the pier reaches into a depth of 10 ft., and fresh water is laid on to it. *Yellow Bluff* is now much overgrown with vegetation; a ledge of boulders extends 1 cable S.E. from it It is high water here, on full and change, at 0h. 30m.; springs rise 16 ft., neaps 9 feet.

Leonard Rock, of 2½ fathoms, lies 1 mile West from the West extreme of Cormorant Island.

Page 505.—**Haddington Island** is 316 ft. high, and steep-to all round; the stone for the parliament buildings at Victoria was quarried at its S.E. end. At 3½ cables N. 26° E. from its North point, with a deep channel between, is a 3-ft. rock on the S.W. extremity of *Haddington Reefs*, a boulder patch which is connected with Dickenson Point (Malcolm Island) by a shallow bank.

Malcolm Island rises to an elevation of about 600 ft. near the centre. Westward of Lizard Point, its northern extreme, is *Trinity Bay*, with anchorage in 10 fathoms and under, bottom of sand and gravel. A bank also extends 2 miles westward of *Pulteney Point*, its S.W. extreme, a patch of 3½ fathoms being found at 1¼ mile W. by N. from the point.

Light.—On the extremity of the gravel spit extending from *Graeme Point*, Malcolm Island, stands a square white wooden building 35 ft. high, showing a *fixed bright* light, elevated 38 ft., and visible 11 miles, but obscured northward by the land between N. 55° W. and N. 75° E.

Directions.—The North point of Blinkhorn Island, just open of the South point of Cormorant Island, E. ¼ N., will lead between that island and Nimpkish Bank, and clear of Alert Rock. Thence steer to pass 1 cable northward of Haddington Island, and Yellow Bluff just open of its North point, bearing East, will lead on in mid-channel clear of Neill Rock.

Page 506.—**Fort Rupert** has a mission station, and is not often visited by passing vessels. Here coal was first discovered on Vancouver Island, in 1835, and it was mined for some years. Fort Rupert has been abandoned by the Hudson Bay Co.,

who have withdrawn their trading station from here. A 5-ft. rock lies 1¾ cable E. by S. ¼ S. from the northern point of Round Island, and at 100 yards S.S.W. of this rock is another with 12 ft. over it.

Page 507.—**Hardy Bay**.—The Canadian Government has constructed a substantial wharf, 3 cables north-eastward of the entrance to the creek at its head; it has a depth of 27 ft. alongside.

Page 508.—**GALIANO ISLAND** is now known as *Nigei* (the name of the great chief of the Nahwitti tribe), to avoid confusion with Galiano Island on the South side of the Strait of Georgia.

Pages 508, 509.—**Shadwell Passage** is not recommended. *Christie Passage* is to be preferred, and has weaker tides than Bate or Browning Passages.

Light.—On *Scarlett Point*, Balaklava Island, at the entrance to Christie Passage, stands a square white building, 37 ft. high, above which is shown a *fixed red* light, elevated 90 ft., and visible 8 miles.

Pages 510-511.—**NEW CHANNEL**.—In 1902, the officers of H.M.S. *Egeria* reported a rock, awash at low water springs, at 9¼ cables S. 70° W. from Race Island; at 1 mile south-eastward of this rock is a rocky patch of 4¾ fathoms. *Cecil Rock*, drying 3 ft., lies nearly 5½ cables W. ¾ N. from Redfern Island.

Page 513.—**Scott Islands**.—Captain Walbran, of the steamer *Quadra*, reports that during winds from S.E. to S.W. there is good anchorage on the N.W. side of *Cox Island*, in 8 to 12 fathoms, and off the N.E. side of *Lanz Island* in about 10 fathoms, about 2½ cables off shore at both. During southerly winds, there is also fairly good anchorage in 13 fathoms, about 3 cables from the head of the bight on the N.E. side of *Triangle Island*.

Cape Scott is described on page 453.

Page 514.—**Inland Channels.**—See Addenda for page 457.

Page 515.—**SEA OTTER GROUP**.—From the centre of *Channel Reef*, Egg Island bears E. ¼ N., nearly 4¼ miles.

Egg Island Light.—On the summit of the islet close westward of Egg Island stands a white dwelling surmounted by a tower, 50 ft. high, showing a *revolving bright* light, attaining its greatest brilliancy every *half-minute*, elevated 85 ft., and visible 15 miles westward between S. 39° E. and N. 6° E. In foggy weather, a *hand-horn* will be sounded in answer to vessels' signals.

Page 516.—*Denny Rock* has 7 ft. over it, and lies 6½ cables S. 7° E. from the light-house.

Page 517.—**Barrier Islands**.—*Mamie Rock*, drying 1½ ft. at lowest tide, lies between Central and Sound Islands, at 2½ cables S. ¾ E. from the West end of the latter. *Frank Rock*, 11 cables N.E. ⅝ E. from Mamie Rock, rises 5 ft. above high water at its western end.

MacBride Bay, on the South side of Smith Sound, and close westward of Round Island, affords anchorage in 22 fathoms, but there are two sunken rocks in the entrance.

Smith Inlet (*Quas-cilla*) has been examined in its western part by Captain J. T. Walbran, in the Canadian government service, who states it has deep water, with no known dangers within. Its shores are formed of rocky precipitous mountains covered with trees. On the South side of the entrance lie Round and Dot Islands, and between the former and Ripon Point the sound is 6 cables wide.

About 6 miles up, on the southern shore, is *Cape Anne*, eastward of which is *Quashelu* or *Quas-cilla Bay*, visited by Vancouver, which affords confined but safe anchorage in its southern bight, in 22 fathoms. A rock, drying at low water, lies 1 cable E. by N. ½ N. from Cape Anne. This bay is connected with Takush Harbour by a channel, only fit for boats.

Beyond Quas-cilla Bay, Smith Inlet extends 18 miles north-eastward, with deep water up to the *Laklekl River* at its head.

Opposite Quas-cilla Bay, and on the North side of Smith Inlet, is *Point Adelaide*, thickly wooded, which has the appearance of a cone from a vessel going up the inlet. Here is the entrance of *Naysash Inlet*, which extends 13 miles northward and north-eastward, but is only about 200 yards wide, with high steep mountains on either side. At 1 mile up this inlet is *Hickey Cove*, where there is a salmon cannery, with a wharf having 12 ft. water alongside; here the tide rises 16 ft. at springs.

Pages 517-518.—**Rivers Inlet,** according to Capt. J. T. Walbran, runs about 12 miles in a northerly direction, and then 10 miles north-eastward to the mouth of the

River Wannock. In the entrance lies *Zero Rock*, of white limestone, 15 to 20 ft. high. *Black Rock* is low and smooth, and 3 or 4 ft. high, with foul ground between it and the island to the northward. A rocky 4-fathoms patch, with 20 fathoms close around, lies in the southern entrance, at 8 cables S.W. from Zero Rock. Vessels should pass north-westward of Zero Rock, and south-eastward of Black Rock, about 1 cable off each, in deep water.

Schooner Passage, the entrance to which is on the western shore, about 10 miles up the inlet, and westward of Walbran Island, has deep water, with low and densely-wooded shores. It has a breadth of about 2 cables, and is frequently used by the Hudson Bay Company's steamers, but it is not suitable for vessels more than 240 ft. long. There is a sunken rock at the western entrance of the passage, to avoid which sharp turns are necessary; and the northern shore should be kept very close on board. A rock, awash at lowest tides, lies 70 yards off shore on the West side of the northern entrance.

Good anchorage is reported in the north-western bight, in 10 to 20 fathoms, where Rivers Inlet turns to the eastward. *Wannock* cannery is on the northern shore, about 2 miles eastward of this bight. At the mouth of the *River Wannock* is the village of *Oweekayno*, and a saw-mill, cannery, and a wooden church are on the South side; the water is too deep for anchorage off Oweekayno. The least water on the bar of the Wannock is 7 ft. at low water abreast the church; there is a wharf at the saw-mill, with a depth of 12 ft. alongside. A mail steamer calls at the establishments in Rivers Inlet once a month.

Page 519.—**Fitzhugh Sound.**—*Swan Rock* is a dangerous rocky patch, not marked by kelp, lying $2\frac{1}{2}$ cables S. by E. $\frac{1}{2}$ E. from *Addenbrooke Point;* it is about $2\frac{1}{2}$ cables in extent, E. by S. and W. by N., with 7 to 12 ft. over it.

Page 521.—**Belakula.**—There is a Norwegian settlement here, with a pier 610 ft. long, reaching into 16 ft. water. Westward of the pier-head is a *beacon*, marking the northern extremity of the drying bank.

Page 522.—**Dean Canal** has the village of *Kimsquit* at its head, at 2 miles above which the inlet is contracted to about 1 mile in width by two low spits, and beyond these, on the East shore, is a bay, where vessels may lie in 40 fathoms, off a pebbly beach.

Pages 522-523.—**LAMA PASSAGE.—Light.**—On the S.E. end of *Pointer Island*, on the South side of the entrance, stands a square white wooden tower, 30 ft. high, showing a *fixed bright* light, elevated 42 ft., and visible 12 miles eastward, between N.W. by W. and S.S.E. In foggy weather, a *hand-horn* is sounded when a vessel's signals are heard.

Walbran Rock, with less than 6 ft. over it, lies 3 cables S. 70° E. from the light house, and is marked by a *red* spar *buoy*. A triangular *white* wooden *beacon*, 15 ft. high, stands on White Point, and this kept well open of the South point of Lama Passage, W.N.W., leads outside the rock.

Small vessels will find excellent anchorage in *Long Point Cove*, southward of Pointer Island.

A rock awash lies close to the northern shore, bearing about W. $\frac{3}{4}$ N. from Serpent Point.

Page 523.—**McLaughlin Bay.**—The rock reported to lie about 6 cables N.N.W. of Napier Point has been searched for in vain, and has been removed from the chart.

At $1\frac{1}{2}$ mile northward of McLaughlin Bay is the new Indian village of *Bella Bella* with a mission station, hospital, stores, &c.; the wharf reaches into a depth of 15 feet.

Page 524.—**Main Passage.—Light.**—On *Dryad Point*, the N.E. extreme of Campbell Island, stands a square white wooden tower, 39 ft. high, showing a *fixed* light, elevated 36 ft.; *bright*, visible 11 miles, between N. 63° W. and N. 11° W.; *red* thence eastward to S. 44° E., and visible 5 miles; and *bright* thence to S. 14° W. In foggy weather, a *hand-horn* is sounded when a vessel's signals are heard.

Page 528.—**SEAFORTH CHANNEL.**—*Mouse Rock* has 5 ft. over it at lowest tides, and is marked by kelp.

Ivory Island Light.—On the southern part of *Surf Point* stands a white dwelling surmounted by a lantern, 30 ft. high, showing a *fixed bright* light, elevated 66 ft., and visible 13 miles southward, between N. 75° E. and N. 52° W. In foggy weather, a *hand-horn* is sounded when a vessel's signals are heard.

Between Ivory Island and Watch Island is *Perrin Anchorage*, so named by Captain Walbran, where vessels can safely lie in 10 to 15 fathoms. In entering, pass close East of Ivory Island; the approach from Blair Inlet is foul.

Kynumpt Harbour.—A *white* conical *beacon*, surmounted by a *ball*, rising 25 ft. above high water, stands on the south-western *Regatta Rock*. A square *white beacon*, surmounted by a *drum*, 40 ft. high, stands on *White Stone*. *Wellington Rock*, with 18 ft. over it, lies 6 cables S. $\frac{1}{4}$ E. from Regatta Rock beacon; its position is pointed out by a tree on the West shore of Ormidale Harbour, marked with white boards, in line with the West extreme of Nevoy Island, bearing S.S.E.

Page 529.—The 10-ft. rock reported to lie 2 cables S.W. of Low Island, searched for unsuccessfully by the officers of H.M.S. *Heroine*, in 1883, was found, in 1895, to lie more than 2 cables S.W. by W. $\frac{1}{4}$ W. from the S.E. extreme of Low Island, and has 6 ft. over it at low water.

A pyramidal *buoy*, painted in *red* and *black bands*, with staff and *diamond*, lies in 2 fathoms, close to the eastern and shoalest part of *Dall Patch*. In 1893, the steamer *Alki*, drawing 17 ft., struck at low water on a rock said to lie a short distance northward of Dall Patch.

Ormidale Harbour, East of Kynumpt Harbour, extends about 1 mile to S.S.E., within Thorburne and Nevoy Islands, with depths of 15 to 20 fathoms in it. Vessels entering pass westward of Nevoy Island, where the channel is $1\frac{1}{2}$ cable wide, the usual anchorage being in a depth of 17 fathoms, distant about 2 cables to the S.S.E. of that island.

Page 531.—**Sarah Island** rises to an elevation of 2,000 feet.

Page 533.—**Khutze Inlet.**—There is good anchorage about 8 cables up the inlet, in 8 fathoms, $1\frac{1}{3}$ cable W. by N. $\frac{1}{2}$ N. from the low green spit on the South shore.

Page 534.—**Douglas Channel.**—In 1905, Capt. Hughes, of the steamer *Princess Beatrice*, reported a rock marked by kelp, in about lat. 53° 30′ N., long. 129° $13\frac{1}{2}$′ W., half a mile off shore; and another, drying at low water, about midway between this rock and the shore, to N.W. $\frac{1}{2}$ W.

Kit-i-mat was proposed as a terminus for the new Trans-Canadian Railway.

Pages 535-537.—**GRENVILLE CHANNEL.**—In 1897, Capt. J. T. Walbran, steamer *Quadra*, reported that for 4 miles north-westward of Davenport Point the western shore is fronted by foul ground to about 1 cable off, or less. The eastern shore is bold. He also states that from Klewnugget northward the eastern shore is not accurately charted, and several islands and openings are not shown.

Page 536.—**Lowe Inlet.**—There is a salmon cannery here.

Page 537.—**Gibson Islands.**—A *white* wooden pyramid *beacon* stands on *Watson Rock*; it is surmounted by a *red drum* rising 22 ft. above high water. In 1897, a dangerous timber snag was found in 19 fathoms, 2 miles E. by S. $\frac{5}{8}$ S. from the South end of Bloxham Island.

Page 538.—**Arthur Passage.**—A dangerous shoal extends 3 cables S.E. by E. $\frac{1}{4}$ E. from the S.E. extreme of *Lewis Island*, having 9 ft. over its outer part, and a rock dries 10 ft. at 1 cable from the land.

Page 539.—**Lawyer Islands Light.**—On the northern island stands a white dwelling with a wooden tower, 48 ft. high, showing a *fixed bright* light, elevated 55 ft., and visible 13 miles southward between S. 73° E. and N. 22° W., but is partially obscured by trees between S. 73° E. and S. 65° E.

Cruice Rock shows 3 ft. above high water, and lies $1\frac{1}{4}$ cable N. 47° W. from the N.W. extreme of the northern Lawyer Island.

Client Reef dries 3 ft. on its eastern edge, at three cables N. 43° W. from Bribery Island, and foul ground extends nearly 3 cables westward. A rock, with 2 fathoms over it, lies $1\frac{1}{4}$ cable N. 50° E. from the East end of Bribery Island.

Page 540.—**Telegraph Passage,** the main approach to Skeena River, had not less than 4 fathoms in it. On its eastern shore is a settlement named *Port Irving*, with a post-office. The channel passes along the eastern shore, and then crosses over to De Horsey Island.

Port Essington has three dangerous sunken rocks in and near the fairway. The northern one, drying 2 ft. at low water, lies nearly $2\frac{1}{2}$ miles N.E. by N. from Veitch or Lambert Point, with the northern point of Village Island, at the West side of Ecstall River entrance, bearing S.E. $\frac{3}{4}$ E. The central and most dangerous rock dries 1 foot, nearly $2\frac{3}{4}$ miles N.E. $\frac{3}{8}$ N. from Veitch Point, and is marked by a *black spar buoy*, lying on the edge of the shoal ground northward of Village Island. The southern rock, awash at low water, lies nearly $2\frac{1}{2}$ miles N.E. of Veitch Point.

The settlement of Port Essington is on the West side of Ecstall River entrance, and on the East side of the river is *Balmoral*, with a large salmon cannery, where

steamers call regularly. There are some sawmills in the vicinity, and potatoes and berries are plentiful.

Middle Passage had a least depth of 2¼ fathoms at low water, and 6½ or 7 fathoms at high water, in 1901. A *red spar buoy* lies in the North entrance, in 5 fathoms, 2½ cables S.W. of Hazel Point, the southern point of Smith Island, and about 3 miles eastward of Lawyer Islands; vessels must not pass westward of it.

North Skeena Passage has a least depth of 2½ fathoms in it and there is anchorage off its western entrance in 4 to 7 fathoms. (See Addenda for page 550). *Woodcock Landing* is now known as *Inverness*, and the anchorage off it is not recommended. At 3 miles farther eastward is a salmon cannery.

Tides.—It is high water at Port Essington, on full and change, at 1h.; springs rise 24 ft., neaps 15 ft., but there is a large diurnal inequality.

Pages 541-542.—**LAREDO CHANNEL.**—In 1905, Capt. Newcomb, of the steamer *Kestrel*, reported a sunken 8-ft. rock, covered with kelp, lying in the middle of the channel, at 5½ miles S.E. by S. from Spray Point. A reef is also reported to extend about 1 mile East from *Channel Rock*, drying in patches. Capt. Hughes, of the steamer *Princess Beatrice*, also reported a rock covered with kelp, at 2 miles N.W. by N. from Spray Point.

Vessels from the South are recommended, after passing Schooner Point, to haul over to the N.E. shore, and keep it close aboard till past Spray Point, as the middle and S.W. side of Laredo Channel are reported to be full of dangers.

Page 542.—**Gander Islands.**—*Goose Ledge* lies 3 miles S. by W. ½ W. from S.E. Gander Island, and 3 miles S.E. ½ E. from South Gander Island.

Tide Rip Islands are 12 miles in extent, the southern group lying about 2½ miles northward of North Gander Island.

Page 546.—**Anger Island**, 5 miles westward of Oar Point, is separated from the coast of Pitt Island by a narrow and intricate channel, which is used by small steamers engaged in collecting salmon for the Skeena River canneries.

Page 547.—**Port Canaveral.**— *Ethel Rock*, with 6 ft. over it, lies in the approach, 5½ cables S. 20° W. from Squall Point, the conspicuous bold point on the S.E. side of the entrance. *Stephen Rock* just covers at high water, and in line with Dimple Point bears N.W. ¾ N. The best way to enter or leave is to pass close round Squall Point. The anchorage is secure, over mud, good holding ground.

Page 548.—**Nubble Mountain** and *False Cone Hill* are situated on the island now known as *Goschen Island.*

Page 549.—**Kitkatlah** is a village on the North side of Dolphin Island, off which there is anchorage in 11 fathoms.

The channel between Dolphin and Goschen Islands has numerous islands in it, and is rocky and dangerous, with strong tides.

Kitkatlah Inlet, extending about 12 miles westward of Kitkatlah, is a spacious sheet of water, with numerous islands and rocks in it, and has not yet been examined. Its northern part was reported to be connected with Edye Passage (page 557) by a channel called *Canoe Passage*, but Capt. Walbran says this does not exist, there being an isthmus 2½ miles wide.

At 5 miles W. ½ N. from the village of Kitkatlah, and westward of Nubble Mountain, is the entrance of *Freedman Pass*, which thence trends 2½ miles to S.S.W., only 100 yards across in its narrowest part, but widening to 1 mile at the seaward end. This passage is intricate, with strong tidal currents, but is used by steamers engaged in the halibut fishery.

Beaver Passage.—The northern and smaller *Connis Rock* is a wooded islet, the southern one being a large flat rock uncovered at low water.

Schooner Passage.—In 1905, the steamer *Princess Beatrice* was reported to have struck on a 2-fathoms pinnacle rock, lying 10¼ cables N.E. by N. from the southern extremity of Dolphin Island.

Page 550.—**Shoals.**—A 3-fathoms shoal lies 3 cables N. 54 °W. from *Green Top Rock.* A 9-ft. shoal lies 4⅔ cables West of *Holland Islet*, and another 9-ft. shoal lies 3 cables farther to S. 75° W. A 6-ft. pinnacle rock lies about 4½ cables N. 59° W. from Island Point, *Porcher Island.*

Kitson Islet, off the mouth of North Skeena Passage (see Addenda for page 540). has shoal ground, of 6 to 8 ft., extending about 6 cables south-eastward from its southern point. The passage between the islet and Leer Point is only navigable by boats.

Page 551.—**METLAH-CATLAH.**—A new wharf has been built 250 ft. westward of the old wharf; it is 400 ft. long, and reaches into 15 ft. water. Vessels entering or leaving are strongly advised to pass northward of Alford Reefs, this channel being marked by a buoy on either side.

Cutch Rock, of 9 ft., 7½ cables S. ½ W. from Knight Island, was not marked by kelp. *Queen City Rock*, of about 2¼ fathoms, lies in the middle of the narrow channel between Isabel Island and the *black buoy* marking the rock half a cable westward of that island.

Buoys, &c.—A *black spar buoy* lies in 3½ fathoms, on the S.E. extreme of the reef extending South of *Tugwell Island*, at 6 cables E.S.E. of Dawes Point. A *red can buoy* lies in 6 fathoms, half a cable westward of *Alford Reefs*. A small stone *beacon*, bearing a staff and cross pieces, rising 8 ft. above high water, stands on the extremity of the rocky ledge extending 1 cable N.W. of *Shrub Islet*. A *black spar buoy* lies close eastward of *Kelp Rock;* and another lies in 6 ft., 2 cables S.S.W. of *Mission Point*.

Page 552.—**Hodgson Reefs** are marked by a *black can buoy*, lying in 9½ fathoms, at nearly 2¼ miles West of Ryan Point, and 3½ cables westward of the western edge of the reefs.

Page 553.—**BIG BAY.**—There is confined anchorage, in 4 fathoms, southward of Swallow Island. On the banks of the river, eastward of the island, is the village named *Georgetown*, where is a small iron shipbuilding yard. The mail steamers call here. *South Island* is 150 ft. high.

Page 553.—**Sparrowhawk Rock** is marked by a *can buoy*, painted in *black* and *red bands*, lying in 2 fathoms.

Pages 554-556.—**PORT SIMPSON** is the nearest harbour on British territory for vessels bringing passengers and cargo for the upper reaches of the Yukon River, viâ Stickeen River. These have now to be transferred into river steamers at Fort Wrangel, on United States territory, as it would not be safe for river boats to navigate the open waters between.

Page 555.—**Birnie Island.**—An unattended *fixed bright light*, elevated 65 ft., and visible 10 miles, is shown from a white wooden turret on a bluff between Knox Point and the S.W. point, visible southward between S. 74° E. and N. 66° W.

It is proposed to erect a small stone *beacon* on the S.W. end of *Hankin Reefs*; a *pyramidal red buoy* lies in 8 fathoms, off their N.W. end. A *red conical buoy* lies in 6 fathoms, off the North extreme of *Harbour Reefs*.

Pages 555-556.—**FORT SIMPSON.**—The Hudson Bay Company has a large store here, and and a hospital is maintained. A long pier reaches into 14 ft. water. The town, now known as *Port Simpson*, contained about 800 inhabitants in 1905, of whom about 100 were white. It has been proposed as the terminus of the projected new Trans-Canadian Railway, to be known as the Grand Trunk Pacific, and is connected with the Canadian telegraph system.

Page 556.—**Work Channel** has an extent of about 30 miles, its head reaching within about 3 miles of Skeena River, and it is surrounded by high and precipitous mountains. On the S.W. shore, about 6 miles from the entrance, is *Trail Bay*, and there is good anchorage in 9 fathoms, in a small cove on its western side. At 2 miles above this is a dangerous pinnacle rock, nearly in mid-channel, drying at low water springs. There is indifferent anchorage at the head of the channel, the water being deep.

Pages 556-557.—**STEPHEN ISLAND.**—*Butlers Cove*, at the southern end of Stephen Island, is an excellent and secure anchorage for small vessels, being clear of danger, and can be entered in the worst weather. The water is deep, and the shores steep-to, there being sheltered anchorage in 12 fathoms, mud, a little above the rock on the North side. There is a fishery station here. *Skiakl Bay*, about 1 mile to the N.W. of White Cliff Point, is said to be full of rocks.

Page 557.—**Goschen Island.**—This is now known as *Porcher Peninsula* (see the Addenda for page 549).

Wallace Rock, with 8 ft. over it, and marked by kelp, lies about 1½ mile W. by N. from Seal Rocks. Broken water is also stated to have been observed much nearer to Warrior Rocks than to Wallace Rock. The passage South of Seal Rocks is safe, and also that northward of the Warriors, but vessels are advised not to pass between.

Page 558.—**Refuge Bay** has a fishery settlement on its West side, with a cannery and a store. The wharf reaches to low-water mark.

Page 559.—**Dundas Islands.**—A rock, drying at low water, is reported to lie about midway between North Dundas and Zayas Island. Other dangers are said to lie 3 miles westward of the N.W. point of Dundas Island, and at 2 miles northward of the N.W. extreme of Zayas Island.

Page 560.—**Pointers Rocks.**—The southernmost rock lies 3 miles W.N.W. from the North extreme of Finlayson Island.

Green Islet is 46 ft. high, bold on its South side, and a rocky reef extends northward of it. A rock, awash at high water, lies 2 cables S. 77° W. from Grey Islet. Foul ground is reported to exist westward of these islets to Whitly Point.

LIGHT.—On the S.W. point of Green Islet is a white wooden dwelling surmounted by a white tower, 45 ft. high, showing an incandescent *flashing bright* light every $5\frac{1}{2}$ *seconds*, elevated 81 ft., and visible 14 miles. It is obscured northward by a chimney.

Pages 560-568, 590.—**The BOUNDARY** between British Columbia and Alaska, as fixed by arbitration in 1903, passes along the northern side of *Dixon Entrance*, and is described in the Addenda for page 454.

Pages 560, 598.—**DIXON ENTRANCE.**—*East Devil Rock*, awash at low water, lies about 4 miles north-westward of Zayas Island. *McCollough Rock*, on which the sea breaks, is reported to lie about 3 miles S.W. by W. $\frac{1}{2}$ W. from the N.W. point of Zayas Island. *West Devil Rock*, $14\frac{1}{2}$ miles E. by N. $\frac{5}{8}$ N. from Cape Chacon, is a dangerous reef, one-third of a mile in extent North and South, a pinnacle at its southern end drying about 10 ft. at low water; broken ground, with 10 fathoms least water, extends $1\frac{1}{8}$ mile northward of the rock, and is said to break in heavy weather.

In 1883, Capt. Carroll, of the steamer *Idaho*, reported a breaker about 7 miles S.E. $\frac{3}{4}$ E. from Cape Chacon, and others about 6 miles S. by E. $\frac{1}{4}$ E. from the same cape. They were unsuccessfully searched for, in 1885.

Cape Fox lies about 7 miles N.N.W. of Gnarled Islands, and over it rises *Harry Saddle Mountain*, 2,088 ft. high. *Lord Rock*, the south-westernmost of the Lord group, lies 5 cables S.W. by S. from the S.W. islet, and rises 10 ft. above high water.

Pages 560, 595.—**TREE POINT Lighthouse,** 4 miles W. by N. of Cape Fox, is a white octagonal building surmounted by a tower, 56 ft. high, showing a *fixed bright* light, elevated 86 ft., and visible 15 miles seaward between S. 72° E. and N. 53° W. In foggy weather, a *Trumpet* sounds a blast of 3 *seconds* in every *half-minute.*

Nakat Inlet extends about 11 miles N.N.W., and *Craig Rock*, with 9 ft. over it, lies in the middle of the entrance. There is sheltered anchorage in a bight within a group of islands.

Pages 560, 595.—**TONGASS,** on *Annette Island*, is no longer a military post, but there is an Indian village here, and the missionary station named *New Metlakahtla*, with salmon canneries. The principal approach, from the West, is about half a mile wide, with depths of 4 to 8 fathoms.

Page 562.—**Somerville Island.**—*Somerville Bay*, indenting the northern side of this island, offers good anchorage in 12 fathoms, sand.

Page 563.—**NASS BAY.**—There are sawmills at *Kincolith*, and coal and gold are found in the vicinity. In winter, the temperature here falls 40° to 50° below zero F.

Page 564.—The Hudson Bay Co.'s post is now abandoned.

OBSERVATORY INLET.—On the eastern shore, $2\frac{1}{2}$ miles northward of North Point (Nass Bay), is a bight affording anchorage in 25 fathoms, sand, at $2\frac{1}{2}$ cables from the beach; a narrow 2-fathoms spit extends southward from the western point, which must not be approached within 3 cables.

Paddy Passage, eastward of Brooke Island, is reported unsafe.

It is high water in Observatory Inlet, on full and change, at 1h. 5m.; springs rise 23 ft., neaps 12 feet. The ebb runs with great strength abreast Nass Bay.

In 1904, Capt. Hughes, of the steamer *Tees*, discovered a dangerous rock with about 5 ft. over it, lying in mid-channel between the S.W. point of Larcom Island and the islet North of Frank Point, in the western entrance to Hastings Arm.

Xschwan salmon fishery is in *Goose Bay*, where there is also a gold-mining establishment.

Page 565.—**Alice Arm.**—A rock, drying about 5 ft., lies $1\frac{1}{2}$ cable West of the South end of *Liddle Island*. A 10-ft. rock lies nearly 2 cables N. 20° W. from the North end of this island, and the channel northward of it has a depth of 6 fathoms. *Alice Rock*, with 7 ft. over it, lies $1\frac{1}{3}$ mile N. $\frac{1}{4}$ E. from the North end of Liddle Island, and vessels should pass eastward of it. There is anchorage in not less than 28 fathoms, about $2\frac{1}{2}$ cables off the drying flat at the head of the arm.

Page 566.—**PORTLAND CANAL.**—*Dickens Point* is 4 miles from Spit Point.
Centre Island is now known as *Hattie Island.*

Page 567.—**Bear River.**—The observation point is now considered to be in lat. 55° 55′ 43″ N., long. 129° 59′ 17″ W.

Page 568.—There is anchorage in 25 to 30 fathoms, mud, about 1¼ cable below Bear River flats, on the eastern side, but exposed to northerly and southerly winds.

Pages 568-571.—**QUEEN CHARLOTTE ISLANDS** are mostly covered with dense forests of spruce, hemlock, cedar, etc. Coal exists on Graham Island, around Skidegate and Masset Inlets, Naden Harbour, Tleedoo, and Skalu Inlet; it compares favourably with that of the Vancouver Island and other western coalfields, and will probably soon be worked. The dollar is now the recognised currency.

Climate.—Snow falls on the mountains, and may reach the coast, where it seldom remains long, severe cold being rarely experienced near the sea. In summer the temperature does not often exceed 75° F. The annual rainfall varies from 45 to 75 inches, being heavier on the western coast. In winter the sky is almost continuously overcast, with constant rain, and frequent violent gales on the western coast. The winds are very changeable, being most prevalent from the North.

Oats have been grown on the islands; ordinary garden vegetables are easily raised; and berries are very abundant.

Page 572.—**PREVOST ISLAND** is now called *Kunghit*, to prevent confusion with Prevost Island off the East coast of Vancouver Island.

HOUSTON STEWART CHANNEL is subject to strong tidal streams and eddies, and should only be used at slack water.

Trevan Rock covers at high water. The anchorage eastward of *Ellen Island* is out of the tidal streams.

Quadra Rocks form a small rocky patch, with 6 to 14 ft. over it, the western extreme lying 5¼ cables N. ½ W. from Hornby Point. In May, 1892, the rise at springs was here observed to be 16 feet.

Shangoi Islets, at the southern entrance, are also known as *Gordon.*

Page 575.—**Huxley Island** is about 1,500 ft. high.

Page 577.—**Selwyn Inlet.**—*Rock-fish Harbour* has good anchorage in 14 fathoms, at its head, and here, on the northern shore, is a spring of good water.

Page 579.—**SKIDEGATE INLET.**—*Lawn Point* has a large boulder off it, 33 ft. high, on which a conspicuous square white patch has been painted. At *Skidegate* is a conspicuous church, and southward of the village is a wharf, with 10 ft. alongside at low water.

Page 580.—There is a wharf, reaching into 7 ft. at low water, in the cove westward of *Image Point*, and near this is a post-office, with a store. Two rocks, with less than 6 ft. water over them, lie about 1 cable off the western point of the cove.

Danube Rock, in the fairway of the inner part of the inlet, has about 4 ft. over it, and lies 3 cables N. by E. ⅞ E. from the N.E. point of Triangle Islet.

Skidegate Channel.—See Addenda for page 586.

Pages 580-581.—**Directions.**—Vessels should use the deep and safe channel off Lawn Point, as several vessels have struck heavily in passing southward of Bar Rocks.

Page 582.—**ROSE POINT.**—With a south-easterly gale, vessels may find sheltered anchorage westward of Rose Point.

Lignite coal is found near the coast, south-westward of *Tow Hill.*

Page 583.—**Masset Inlet.**—Lignite exists on the banks of the Ya-koun and Ma-min Rivers.

Page 584.—**VIRAGO SOUND.**—Edensaw and Naden Points are about 5 miles apart. Between the shore banks on each side of the entrance, the navigable channel is 4 cables wide, with a least depth of 3¼ fathoms. In July, 1896, the village of *Kung* was found to be entirely deserted, and no pilots could be obtained by firing a gun at the outer anchorage. Lignite is found at Naden Harbour.

Page 585.—**North Island.**—A rock, on which the sea breaks heavily, lies about 8 miles N.W. by W. from the N.W. point of the island.

Page 586.—**Cape Knox** forms *Lepas Bay* on its southern side, and about 8 miles southward of it is the village of *Tleedoo*, near which lignite has been found.

Frederick Island is about 14 miles South of Cape Knox, and the channel between it and the shore is reported to be foul. At 6 miles south-eastward from it is *Ti-ahn Point*, with a village eastward of it.

Port Ingraham, or *Kio-kath-li Inlet*, about 13 miles S.E. of Frederick Island, is about 2½ miles wide at the entrance, between two high bluffs, with some islets off the South side. It extends about 5 miles eastward, and at its head is a beach, with depths of 9 to 10 fathoms off it.

Skaloo Inlet, eastward of *Hippa* or *Nesto Island*, extends about 4 miles north-eastward, and coal has been found at its head. At 3 miles north-westward of this is a narrower inlet, named *Athlow Bay* or *Port Chanal*, with an island on the South side of the entrance.

Vessels are advised not to pass between Hippa Island and the coast, the channel not having been examined.

About 8½ miles south-eastward of Hippa Island is a sunken rock, on which the sea breaks heavily, in about lat. 53° 26′ N., long. 132° 49′ W.

RENNELL SOUND, the largest inlet on the West side of Graham Island, extends about 10 miles south-eastward, and is from 3 to 5 miles in width, with some islands in it. On the North side of the entrance is *Tartoo Inlet*, extending about 3 miles northward, between high mountains, with two salmon streams at its head.

Cartwright Sound, 7½ miles southward of Rennell Sound, is 2 miles wide at the entrance, and extends about 5 miles north-eastward, with rocky shores, and has a river and fine sandy beach at its head. A dangerous reef extends 1 mile off *Hunter Point*, on the South side of the entrance.

Keow Inlet, 2 miles eastward of Hunter Point, extends 2 miles north-eastward between high mountains, down which run cataracts.

Marble or *Guigatz Island*, lying about a mile off Keow Inlet, is high, peaked, and about 2 miles in circumference. Three islets lie in the channel between it and the coast, and a breaking rock lies half a mile eastward of it ; a rocky ledge extends half a mile off its S.W. extreme.

SKIDEGATE CHANNEL.—The main western entrance, 3 miles East of Marble Island, and 3½ miles N.N.W. of Buck Point, is about 1 mile wide, and foul ground is said to extend 1 mile westward of its South point. On its North side, 2 miles within the entrance, is an inlet named *Dawson Harbour*, affording secure anchorage at the head of its eastern arm, in 16 to 20 fathoms.

Buck Point is rather low and rugged, and is on the South side of the western entrance of the boat channel leading into the inner part of Skidegate Channel ; on the North side of the entrance is the village of *Cha-atl*.

Page 587.—At 2 miles south-eastward of Buck Point is the narrow *Kitgoro Inlet*, at the head of which there is anchorage in 13 fathoms. At 3 miles farther on is *Kaisun Harbour*, with good anchorage in 17 fathoms, mud, behind an island, on the North side of Inskip Channel entrance.

Moore Channel.—A heavy breaker has been observed in the entrance, about 1¼ mile N.N.W. of Cape Henry.

Page 588.—**Cape Henry** is reported to be situated 7 miles south-eastward of Moore Channel.

TASOO HARBOUR, reported to be 5 miles south-eastward of Cape Henry, is easy of access for steamers, and well sheltered. In 1896, Capt. Meyer, of the steamer *Danube*, could find no good anchorage ; she lay 1 cable off a conspicuous gravelly beach on the North shore, eastward of three rocky islets.

Capt. Meyer also stated that when steering along the shore between Tasoo Harbour and San Christoval Mountains (in lat. 52° 29′ N.), no large openings were seen, as marked on the chart.

Pages 590-594.—**ALASKA.**—The boundary between United States and Canadian territory, as settled by arbitration in 1903, is described in the Addenda for page 454. Northward of the head of the Portland Canal, the boundary passes inland to Mount St. Elias.*

The area of the Territory of Alaska is now estimated at 590,884 square miles, or about one-fifth of that of the United States, the coast-line having an extent of over 26,000 statute miles, being greater than that of the United States. By the census of 1890, the population numbered 32,052, and by that of 1900 it was 63,592, of whom 30,493 were whites, and 29,536 Indians ; it is fast increasing, owing to the opening up of the gold producing areas. Sitka is the present seat of government, and customs and other officials are now stationed at Wrangell, Juneau, Skagway, Ketchikan, Kadiak,

* Recent explorations have decided that Mount St. Elias is not the highest peak of the North American continent. This distinction is now claimed for the summit of Mount Bolshaya or McKinley, 20,464 ft., in lat. 63° 4′ N., long. 151° W.

Unga, Valdez, Unalaska, St. Michael, Nome, and on the Yukon. Regular services of steamers connect the principal settlements with Victoria, Seattle, etc., and most are now in telegraphic communication,* a submarine cable having been laid between Seattle, Sitka, and Valdez.

At present, furs, fish, gold and other minerals, and timber, are the chief commercial products of Alaska; in 1904, the gold yield was estimated at 9,000,000 dollars, and in 1901, furs at about 3,000,000 dollars. The most valuable fur, that of the sea-otter, is now becoming very scarce. The annual pack of salmon has amounted recently to over 2,000,000 cases, valued at about 7,000,000 dollars, Bristol Bay and Kadiak Island being the chief sources. The best timber is found between the S.E. boundary and Prince William Sound, and several sawmills are now at work.

Lignite coal is found in many parts, burning rapidly with little smoke, and a mine is now being worked near Killisnoo. The most important known coalfield is on the eastern shore of Cook Inlet. The total output in 1904 amounted to only 620 tons. Petroleum is found at Comptroller Bay, Cook Inlet, Lake Iliamna, and many other parts of the coast, and wells have been sunk at the places mentioned.

The United States Government has surveyed the more frequented parts of the coast and islands, the great extent and intricacy of the coast-line, and the innumerable off-lying islands and rocks, causing this work to be very slow and tedious. Every care must be exercised when navigating in this region, as previously remarked in the Addenda for pages 351 and 457.

In addition to information derived from these sources, much additional matter has been gleaned from the bulletin entitled "Commercial Alaska," issued by the U.S. Department of Commerce, in 1903. For an interesting account of a recent visit to this region, the general reader is referred to the beautifully illustrated work "Alaska, giving the Results of the Harriman Expedition," in three volumes, 1902 and 1904, published in London.

Pages 593, 595.—**Tongas.**—See the Addenda for page 560.

Page 595.—**Tree Point Lighthouse.**—See the Addenda for page 560.

REVILLA GIGEDO CHANNEL.—Capes Fox and Northumberland are 18½ miles apart, E. ¾ N. and W. ¾ S.

Boca de Quadra is very deep, and anchorages are scarce. In its eastern part is a salmon cannery, the only anchorage near which is in 11 fathoms, on a rocky shelf, midway between Cygnet and Grouse Islets.

Duke Island, on the western side of the southern entrance of Revilla Gigedo Channel, rises to a height of 1,767 ft. at *Mount Lazaro*, over Cape Northumberland, its southern extreme. In other parts it rises in numerous round-topped hills, 200 to 500 ft. high, and is all densely wooded. Its S.E. and S.W. sides are fronted by numerous dangerous off-lying rocks. *Barren Islet*, the southernmost, lies 7 miles S.E. by S. ¼ S. from Cape Northumberland, and is about 20 ft. high. *Yellow Rocks*, 5 miles N.E. by N. ¼ N. from Barren Islet, are about 20 ft. high. *East Islet*, 4½ miles N. by W. ½ W. from Yellow Rocks, is low and wooded.

In a southerly gale, vessels might anchor in the bight north-westward of Duke Point, the eastern point of Duke Island. There is also anchorage in 7 to 14 fathoms, in *Reef Harbour*, between Grave Point and Duck Islet to E.S.E. *Ponds Bay*, south-westward of Graves Point, forms a safe harbour, with moderate depths, over soft mud, but the approach is encumbered with dangers.

Mary Island lies 3 miles northward of Duke Island, Cat Island and numerous rocks lying between. It is about 200 ft. high, with low wooded shores. There is anchorage in 14 fathoms, about 1 cable S.W. ½ W. of Point Winslow, its northern extreme. On its N.W. side is a settlement, with a custom-house and post-office, where steamers call regularly; here there is anchorage in 10 to 12 fathoms, mud, 1 cable off shore. It is high water here, on full and change, at 0h. 10m.; springs rise 16¾ ft., neaps 12¾ feet.

Light.—About half a mile south-eastward of Point Winslow stands an octagonal white wooden tower, about 45 ft. high, showing a *fixed* light, elevated 67 ft., and visible 14 miles. It shows *bright* eastward between S.E. ¼ E. and N.W. ¼ W.; *red* thence, over Twin Islets, to N.W. by W. ⅓ W.; and *bright* thence to W.N.W. In foggy weather, a *Trumpet* sounds *two* blasts of 3 *seconds* in every *half-minute*, thus :—blast, silent 3 seconds, blast, and then silent 21 seconds.

Twin Islets, 2 miles N.W. ¼ W. of Point Winslow, are low and wooded.

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*Standard Time.—Throughout S.E. Alaska, the meridian of 135° W. is used for standard time, or 9h. slow of Greenwich Mean Time; at Kadiak, etc., the 150° W. meridian is used, or 10h. slow of G.M.T.

ANNETTE ISLAND, westward of Mary Island, is mountainous, rising to an elevation of 3,684 ft. at *Mount Tamgas*, near its southern end, and often carrying snow on its summit all the year. *Ham Island* lies close off the middle of the eastern side of Annette Island, and off its northern side is a range of islets and rocks, terminating at its eastern end in *Hog Rocks*, one of which rises 5 ft. above high water. A *black can buoy* lies in 12 fathoms, N.N.E. of the outer Hog Rock.

Felice Strait, separating Mary and Duke Islands from Annette Island, has several sunken dangers in it, but is used by the mail and other steamers. Its navigable western entrance passes northward of Percy and Hotspur Islands, and thence vessels usually pass close along the southern side of Annette Island, northward of *Ajax* and *Wallace Reefs*, each of which is marked on its northern side by a *red nun buoy*. In August, 1905, Capt. J. H. McCormick, steamer *Marie G. Hoover*, reported that a reef, uncovering at low water, lies in mid-channel between Ajax Reef and Hotspur Island.

At 4½ miles W. by N. ¼ N. from the eastern point of Ham Island is *Harbour Point*, low and wooded, within which is *Pow Islet*. *Hassler Harbour*, S.E. of Pow Islet, is small, but offers good shelter in 6 to 8 fathoms; vessels can also anchor in 7 fathoms, westward of Pow Islet.

At 2¾ miles W. by N. ½ N. from Harbour Point is *Reef Point*, and there is a settlement in the bight southward of it. *Spire Islet*, 1¼ mile W. by N. of Reef Point, has a reef extending 2½ cables N. by E. from it, off the N.E. extreme of which lies a *black can buoy*, in 7 fathoms.

Race Point, the northern extreme of Annette Island, is low and wooded, and rocks extend 2½ cables off it. At 1 mile N.N.E. of Race Point, with a deep channel between, is *Mountain Point*, also low and wooded, the land within being mountainous. About half a mile E. by N. from it are *Cutter Rocks*, awash at low water, and marked by a barrel *beacon* 20 ft. high.

George and Carroll Inlets, deeply indenting the southern side of Revilla Gigedo Island within Mountain Point, are very deep, and at present of no importance to navigation.

Bold Island, eastward of Reef Point, is 349 ft. high, the channel southward of it being that generally used.

Thorne Arm, N.E. of Bold Island, is deep, and extends about 10½ miles northward; anchorage may be found in its N.W. and N.E. angles. Gold mining is carried on here. *Cone Islet*, on the eastern side of the entrance, is 300 ft. high.

BEHM CANAL, insulating Revilla Gigedo Island, is navigable by the largest vessels, and has but few known dangers in it. Its southern entrance is 2¼ miles in width, between Alava and Sykes Points. This region has now been surveyed, and the chart shows many discrepancies with the previous description of it.

Page 596.—*New Eddystone Rock*, lying in mid-channel, in lat. 55° 30′ N., is now delineated as a sunken danger, situated south-westward of some islets on the eastern side of the canal.

Burrough Bay, at the northern extreme of Behm Canal, had a salmon cannery on the eastern side of its head, now abandoned. *Unuk River* runs into the head of the bay, and is said to be navigable by canoes for 70 miles.

Page 597.—**Yess or McDonald Bay,** a long narrow inlet, 5 miles westward of Bell Island, has a salmon cannery about 2 miles up.

Port Stewart is only suitable for very small vessels.

Helm Bay, 7 miles southward of Port Stewart, extends 7 miles north-westward, and has several islets and rocks in its outer part. Gold mining is carried on here.

Naha Bay is a narrow inlet on the eastern side of Behm Canal, opposite Helm Bay. On its northern side is the village of *Loring*, with a large salmon cannery and a post-office, about a cable off which there is anchorage in 17 to 20 fathoms.

Moser Bay, next southward of Naha Bay, is fronted by some islets. There is good anchorage in 20 fathoms, mud, near its head.

Cape Caamano, in lat. 55° 30′ N., long. 131° 57′ W., is steep and craggy, with high mountains above it, its eastern part fronted by rocks and reefs.

Page 598.—**GRAVINA ISLAND,** westward of Annette Island, is low in its central part, with parallel mountainous ridges on either side. *Vallenar Point*, its northern extreme, is low and wooded, with islets and rocks extending over half a mile W.N.W. of it. At nearly 2 miles W.N.W. of it are the two *Guard Islets*, about 25 feet high, with a 6-ft. patch three-eighths of a mile E.S.E. of them.

Light.—On the summit of the northern Guard Islet stands a square white wooden tower 34 ft. high, showing a *fixed* lantern light, elevated 79 ft., *red* between N. 89° E. and S. 59° E. (32°), and *bright* elsewhere. In foggy weather, a *Bell* is struck *once* every 20 *seconds*.

TONGASS NARROWS has been surveyed, and (as stated in the Addenda for page 457) is safe for the largest steamers, but local knowledge is necessary. *Ward Cove* affords excellent anchorage in 12 fathoms, on its western side; *Bolles Ledge*, a sunken reef 1½ cable off the eastern shore, is marked by a *red nun buoy* on its western side. It is high water here, on full and change, at 0h. 24m.; springs rise 19¼ ft., neaps 14½ feet.

On *Peninsula Point*, on the N.E. side of Tongass Narrows, stands a triangular *white* wooden *beacon*, 12 ft. high, with East Island, at the entrance of Ward Cove, bearing N.W. ⅜ W. On *Rosa Reef* stands a concrete pyramid *beacon*, 20 ft. high, upper half *white* and lower half *black*, surmounted by a staff bearing a *black* spherical *cage*.

On the Revilla Gigedo Island shore, northward of the N.W. end of Pennock Island, is the village of *Ketchikan*, a gold-mining centre, with a post-office, the inhabitants numbering 460 at the census in 1900.

Pennock Island lies in the S.E. part of Tongass Narrows, and is low, with a passage on either side. The reef extending from its western end is marked by a *can buoy*.

The channel southward of Pennock Island is preferable to the northern channel, but is little more than a cable wide where narrowest. Nearly in mid-channel, within the southern end of the northern channel, is *California Rock*, marked by a *nun buoy* (*red* and *black bands*) on its eastern side; about a cable northward of it is *Idaho Rock*, marked by a *red nun buoy* on its southern side.

At 1 mile S. 66° E. from the S.E. extreme of Pennock Island is a rock with 16 ft. over it, on which the tug *Richard Holyoke* grounded in 1903; it is marked by a *nun buoy* (*red* and *black bands*), on its S.W. side.

Tides.—The flood stream usually sets into Tongass Narrows from the South, and sometimes from the North; the ebb sets northward and southward. It sometimes runs 4 knots an hour, but the usual rate is 1 to 2 knots.

Cape Northumberland, the South point of Duke Island (see Addenda for page 595), is low and wooded. At 7 miles W. by N. ¼ N. from Barren Rock is *West Rock*, above water, with sunken rocks adjacent. *Hassler Reef*, 6 miles West of West Rock, dries 10 ft. at low water, and is the westernmost of the rocks and reefs off the western side of Duke Island.

Pages 598-599.—*Devil's Ridge, &c.*—See the Addenda for page 560.

Page 599.—**Felice Strait.**—See the Addenda for page 595. *Point Percy* is the westernmost of a group of islets lying in the passage between Duke and Annette Islands.

Tomgas or Tamgas Harbour.—*Point Davison* lies about 3 miles N. by W. ¾ W. from Point Percy, and is in lat. 54° 59¾′ N. It extends 5½ miles north-westward, and in entering keep over to the eastern side, as the western shore is fronted by rocks. *Mule Rock*, on its eastern side, is awash at high water. There is no anchorage in the outer part, but in the northern part vessels can anchor in 5 to 8 fathoms.

Nichols Passage divides Annette Island from Gravina Island, and has numerous islets and reefs in its southern part, especially off *Port Chester*, on the western side of Annette Island, where there is an Indian village and mission station, the *New Metlahkatlah*, with a salmon cannery, sawmills, stores, &c. *Kelp Rocks*, lying in mid-channel off Port Chester, are marked by a *red nun buoy*, in 10 fathoms, off their N.E. side. At 1¼ mile to E. by S. ½ S. from this buoy is a *black can buoy*, in 10 fathoms, off the extremity of the reef extending from *Gull Islet*, which lies westward of Village Point.

Cape Chacon is in lat. 54° 42′ N., long. 132° 1′ W. At 3¼ miles S.S.W. of it are *Nunez Rocks*, partly uncovered about half-tide, on which several vessels have been wrecked, the tides running very strongly hereabout. (See also Addenda for page 560.) *Nichols Bay* is a long narrow inlet 2 miles westward of Cape Chacon, affording fair anchorage, but is dangerous to enter in bad weather.

McLean's Arm, 6 miles northward of Cape Chacon, is too deep for convenient anchorage. *Gardner Bay*, 1 mile farther on, can only be safely entered with local knowledge.

Page 600.—**Moira Sound,** and the inlets northward of it, are frequented for the salmon fishery. It extends about 11 miles south-westward, and has numerous rocks in its entrance, and vessels entering should pass northward of them all. *Niblack Anchorage*, southward of the western entrance point of North Arm, is a landlocked

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CLARENCE STRAIT.—*Lyman Rock*, on the western side of Lyman Anchorage, is marked by a *red spar buoy*, in 5⅜ fathoms, 58 yards to N.E. by N. ¾ N.

basin, affording excellent sheltered anchorage; the entrance is between the outer island and the range of rocks eastward of it. Gold and copper are found in the vicinity. It is high water here, on full and change, at 0h. 9m.; springs rise 14¾ ft., neaps 11¼ feet.

Cholmondeley Sound extends about 15 miles westward and is deep and clear. There is anchorage in *Dora Bay*, in 35 fathoms, on its southern side. *Chasina or Chasintzeff* anchorage will afford shelter from S.E. gales, in 19 fathoms, rocky bottom. There is similar anchorage westward of *Skin Islet*, on the North side of the entrance of the sound, over rock, sand, or mud.

CASAAN or KASAAN BAY is 4½ miles wide at its entrance, between Island Point on the South and Grindall Island on the North, and within this line lie High and Patterson Islands. Coal is reported to exist here. *Skowl Arm*, the southern branch, has a small Indian village on its North side, 3 miles within the entrance.

Karta Bay, 17½ miles westward of Casaan Bay entrance, and close westward of *Baranovitch*, is one of the best anchorages of Alaska, and is easy of access, with depths of 8 to 10 fathoms, mud.

Twelve Mile Arm, the south-western branch of Casaan Bay, is narrow, and affords anchorage anywhere. Gold-mining is carried on here, and deposits of copper-ore are worked.

Tolstoi Bay, 16½ miles north-westward of Grindall Island, is a deep inlet running 4 miles S.S.E., and there is good sheltered anchorage near its head, in 18 fathoms.

Thorne Bay, westward of Tolstoi Bay, is another narrow inlet, the entrance passing between two wooded islets. Near the head of the N.W. arm is a fishing settlement, off which there is good anchorage in 5 to 8 fathoms, mud.

ERNEST SOUND, formerly Prince Ernest Sound, is 4½ miles wide at its southern entrance, between Point Le Mesurier and Point Onslow to N.W. ½ N. *Union Bay*, eastward of the former point, has anchorage in 18 fathoms, 3 cables off the eastern side of its head. The Hudson Bay Company's vessels used to approach and leave Wrangell Harbour by way of Ernest Sound, Blake Channel, and Eastern Passage, but Clarence and Stikine Straits are much more direct and less intricate. *Zimovia Strait*, separating Etolin and Wrangell Islands, is blocked by rocks in its central part. *Warde Point* is in about lat. 56° 11′ N.

Page 601.—*Point Highfield* has the *Labouchère* salmon cannery on it. A 6-ft. pinnacle rock, 3¾ cables N.E. by E. from the point, is marked by a *red nun buoy*, lying in 16 feet.

Etoline Harbour, about 1 mile southward of Point Highfield, is now known as *Wrangell Harbour*.

WRANGELL contained 868 inhabitants at the census in 1900, and rose to some notoriety, being situated at the mouth of the Stikine River, one of the main approaches to the Yukon River goldfields. Here ocean-going vessels transferred their passengers to the river steamers, and the navigation of this river is free by treaty for Canadian as well as United States vessels. Only small vessels can enter the harbour, large vessels anchoring outside, or N.W. of *Station Point* to the southward.

Pages 601-602.—**STIKINE RIVER**.—At 1½ mile northward of Point Highfield is the edge of the steep shallow mud-flats fronting the mouth of the river, on which lie some islands and rocks. At high water only boats could pass through a channel over them into Frederick Sound. Gold is found on *Mitkof Island* to the westward.

Stikine (or Stickeen) River rises about 200 miles in the interior, and enters the sea by two mouths; the northern one, debouching in Frederick Sound, is only navigable by boats at high water. The southern entrance, about 1½ mile northward of Point Highfield, had a least depth of about 2 ft. at low water, and spring tides rise 18 ft.; it is constantly changing.

During the winter the river is frozen over, but from May to the middle of November it is navigable for vessels drawing 4 ft. as far as *Telegraph Creek*, a distance of 138 miles from Fort Wrangell, and at 12 miles below Telegraph Creek is the settlement of *Glenora*. A railway was proposed from Glenora to *Lake Teslin*, about 140 miles distant, whence ordinary river vessels and boats can reach the Yukon. Garden roots and vegetables have been raised on *Farm Island*, at the entrance of the river, and salmon and wildfowl abound in the surrounding region.

Vessels approaching Wrangell Harbour from the West can safely use the channels between Zarembo, Vank, Sokolof, and Greys Islands. *Baht Harbour*, an open bight near the middle of the northern side of Zarembo, affords anchorage in 8 to 12 fathoms, 2 or 3 cables off shore, sheltered from S.E. gales.

Page 602.—**WRANGELL STRAIT** is 25 miles in length, varying from a quarter to three-quarters of a mile in width, and is only available for vessels drawing up to

17 ft., as previously explained in the Addenda for page 457. It has numerous dangers in it, many marked by *buoys* or *beacons*, but local knowledge is necessary for its safe navigation; there were no local pilots here. The tidal streams enter the strait from either end, meeting about half-way, and running from 2 to 6 knots an hour.

Light.—A *fixed bright* lantern light, elevated 20 ft., is shown from a post on the North point of Mitkof Island, which forms the southern side of the northern entrance of Wrangell Strait.

There is good anchorage in 7 to 9 fathoms, mud, about half a mile eastward of the northern entrance of the strait, very convenient for vessels waiting for the tide, or delayed by fog.

Duncan Canal is really an inlet, extending about 20 miles N.W. by W. into the S.E. side of Kuprianof Island. Its entrance is nearly closed by an island lying within it, and the passage from Wrangell Strait, northward of Woewodski Island, is only fit for small vessels. Coal is reported to exist on the Lindenberg Peninsula of Kuprianof Island.

Page 602.—**Dewey Anchorage,** off the southern side of Etolin Island, is well sheltered from southerly winds, but the bottom is rocky and irregular, and several dangerous reefs lie in the approach, north-westward of *Onslow Island.*

McHenry Anchorage, 3½ miles north-westward of Dewey Anchorage, is about half a mile in extent, and clear, with secure anchorage in 7 to 12 fathoms, mud, as convenient.

Ratz Harbour, on the opposite side of Clarence Strait, is small, with landlocked anchorage in 8 to 11 fathoms. The entrance is about 1 cable wide, between projecting reefs on either side. *Coffman Cove*, 11 miles farther north-westward, has good anchorage in 10 to 15 fathoms, mud.

Page 603.—**Lincoln Rock.**—A rocky islet lies on the N.E. side of Clarence Strait, at 4 miles W. by N. of Point Stanhope. At about a third of a mile S.W. of it is *Lincoln Rock*, a dangerous rock awash at lowest tide, now bearing a lighthouse.

Light.—On Lincoln Rock stands a white wooden building about 40 ft. high, showing a *fixed bright* light, elevated 58 ft., and visible 13 miles. In foggy weather, a *Trumpet* sounds a blast of 3 *seconds* in every *half-minute.*

Harrington Point is 6¾ miles north-westward of Lincoln Rock. *Steamer Bay* extends 2 miles eastward of it, and at its head is a basin easy of access, with anchorage in 10 to 16 fathoms.

Stikine Strait is 6 miles wide at its southern entrance between Harrington Point and Nesbitt Point (in lat. 56° 14′) to W. by N. The strait is deep and clear, and vessels can pass on either side of *Woronkofski Island*, as convenient.

Kashevarof Islands occupy the northern part of Clarence Strait, between the northern part of Prince of Wales Island and Zarembo Island. *Kashevarof Passage*, westward of them, is unsafe, owing to the numerous dangers and strong tides. *Snow Passage*, eastward of them, is half a mile wide between Bushy Island and Zarembo Island, but the tides in it run from 2 to 6 knots an hour.

Key Reef lies nearly in mid-channel, at 3½ miles S.W. ¼ W. from Harrington Point, and is marked by a pyramidal concrete *beacon*, painted upper part *white* and lower part *black*, bearing a staff and ball, elevated 32 feet. A rock, drying at low water, lies three-quarters of a mile to S.E. by E.

Page 603.—**SUMNER STRAIT** separates Prince of Wales Island from Kuprianof Island, and in about mid-channel of its eastern part, westward of Zarembo Island, are two dangerous rocky patches, steep-to. *McArthur Reef*, the eastern, has 2½ fathoms over it, and is marked by a *nun buoy*, painted in *red* and *black bands*, lying in 6 fathoms, off its N.E. side, at 3 miles S.E. ½ E. from Mitchell Point. At 3¼ miles S.W. ½ W. from McArthur Reef is *Eye-opener Rock*, drying 12 ft., marked by a mast *beacon*, bearing a *barrel.* (See the Addenda for page 457).

St. John Harbour, at the N.W. extreme of Zarembo Island, is sheltered by a group of islets; vessels pass eastward of them, and find anchorage in 12 fathoms, mud.

Totem Bay, 5½ miles westward of Mitchell Point, has some curious rocky pinnacles on its western shore, and offers good anchorage near its centre, in 8 fathoms, mud.

Barrie Point had a salmon saltery on it, and here a branch of Sumner Strait runs N.W. by N., leading to *Keku Strait*, a narrow intricate channel leading to Frederick Sound, only navigable by small vessels.

Red Bay, 3 miles westward of Colpoys Point, is a narrow intricate inlet 3 miles in extent, the entrance being only 75 yards wide in its narrowest part, with 2¼ to 4 fathoms in it. About half-way in, on its eastern side, is a salmon saltery.

Baker Point is in about lat. 56° 21′ N., long. 133° 37′ W. *Helm Rock*, about a third of a mile north-westward of it, has only 9 ft. over it at low water.

Port Protection extends 3 miles E.S.E., with irregular soundings over rocky bottom. There is good anchorage on either side of the chain of islets in its upper part.

Page 604.—**Shakan** or *Chican Bay*, 10 miles southward of Port Protection, is filled with islands, and at its head is a small village, with a post-office, sawmill, and store. It is approached by a deep channel along its southern shore, but the entrance is only a cable wide between rocky ledges, with 6 fathoms in it. There is good anchorage off the village, in 7 to 9 fathoms, mud. It is high water here, on full and change, at about 0h. 6m.; springs rise 11½ ft., neaps 8¾ feet.

Shipley Bay, next southward of Shakan Bay, has good anchorage at its head, in 14 fathoms, mud.

Port Beauclerc.—There is anchorage in the bight E.N.E. of Edwards Island; in the N.W. extreme of the port; and in its southern angle.

A rocky bank of 8 fathoms, 3 miles eastward of *Point Amelius*, is marked by whirls and tide-rips, and should be avoided. *Point St. Alban* is in about lat. 56° 5′ N., long. 133° 59′ W.

Page 605.—**PORT McARTHUR**, 4¼ miles N.N.W. of Cape Decision, is an inlet extending 1½ mile north-westward, sheltered by a group of islets off the entrance, and affording excellent anchorage in all weathers, in about 16 fathoms. In entering, pass northward of the northern islet; there is also a 6-fathoms passage southward of it.

CAPE DECISION, the South extreme of Kuiu Island, is in lat. 56° 0¼′ N., long. 134° 7½′ W., and there is a clear channel 1 mile wide between it and *Spanish Islands*. Coal is reported to exist on the N.E. and western parts of Kuiu.

Coronation Island is wooded and mountainous, Needle Peak rising to an elevation of 1,700 ft. near its centre. On the East side of *Nation Point*, its N.W. extreme, is *Egg Harbour*, a narrow inlet, with good anchorage for small vessels in 5 to 7 fathoms; it is frequented by Indians, who gather birds' eggs on the off-lying *Hazy Islands*. Breakers have been observed about 2½ miles N.W. ½ W. from Nation Point.

Aats Bay, on the northern side of Coronation Island, affords anchorage in 5 to 8 fathoms, sand.

Warren Island rises to an elevation of 2,140 ft. near its northern end, which is separated from Cape Pole by a channel 1¼ mile wide. A sunken rock lies three-quarters of a mile S.W. by S. from Borlase Point, its western extreme.

The outer coast of the Prince of Wales Archipelago, between Cape Pole and Cape Muzon, has not yet been surveyed. Steamers bound from Sumner Strait to Klawak, with the aid of a pilot, use the *Inside Passage*, passing through San Christoval Channel into Port Bucareli.

PORT BUCARELI has not yet been surveyed, and the chart must be used with caution.

Cape San Bartolome is comparatively low and wooded, its extremity being in about lat. 55° 12½′ N., long. 133° 40′ W., with a rock off it.

Page 606.—*Port Dolores*, the bay on the N.W. side of Suemez Island, was the usual anchorage of the Russian traders.

Vessels bound to Klawak are advised to keep in mid-channel, and pass northward of San Juan Bautista Island.

Klawak Inlet, the northern angle of Port Bucareli, is fronted by numerous reefs. Near its head is the village of *Klawak*, or *Tlewak*, the most important settlement on Prince of Wales Island. It has a post-office, salmon cannery, stores, sawmill, &c., and is visited regularly by a steamer from Wrangell.

Cape St. Augustine, in about lat. 54° 55′ N., consists of a high round mountain, sloping abruptly to a small nipple hill, and terminating in a low pyramidal knoll.

Cape Magdalena, the N.W. headland of Port Bazan, may easily be recognised by its high white bluffs.

Liscome Bay is 3 or 4 miles westward of Cape Muzon, and close over it rises a round hill with a peculiar bare reddish cone.

San Carlos or *Forrester Island* is about 1,500 ft. high. In 1888, a rock, on which the sea broke heavily, was reported to lie about 5 miles E. by N. ¼ N. from *Rasa Isle* or *Wolf Rock*.

CAPE MUZON has an Indian village on it, and the tides run strongly off it.

Kaigahnee Strait is easily navigable by keeping mid-channel as far as *Howkan Narrows*, 7½ miles up, and here, on its eastern side, is the large Indian village of *Howkan*, or *Jackson Post-office*, with a mission station, sawmills, and stores, visited regularly by a steamer from Wrangell. *American Bay* affords good anchorage near its head, in 15 fathoms.

Above Howkan there are several islets and rocks in the channel, and vessels bound hence, through *Tlevak Strait* and *Ulloa Channel*, need local knowledge, but there is no difficulty for vessels up to 18 ft. draught.

CORDOVA BAY has a large group of islets and rocks in its entrance, between which and Long Island there appears to be a clear passage. It branches out into several large inlets, and has not yet been surveyed. On its eastern side, in about lat. 54° 53′ N., is the village of *Klinkwan*, southward of which is *Hunters Bay*, a narrow inlet, with a salmon cannery. *Hetta Inlet*, the northern angle of the bay, leads to *Copper Harbour*, near the head of which is a wharf, reaching into 5 fathoms at low water.

Sukkwan Strait runs westward of the entrance of Hetta Inlet, and has not less than 3¼ fathoms at low water in the narrows, where the channel is only about 50 yards wide. The cannery steamers pass through the strait to *Skookum Chuck* into Ulloa Channel.

Pages 606, 612, 619.—**CAPE OMMANEY,** 20½ miles westward of Cape Decision, is now considered to be in about long. 134° 40′ W. It rises to an elevation of about 1,000 ft., and terminates in a rocky cliff, close off which lies *Wooden Islet*. The tidal streams set strongly round it.

Page 607.—*Point Ellis* is in about lat. 56° 33½′ N., long. 134° 19′ W., and near it is an extensive salmon cannery, with large stores.

FREDERICK SOUND appears to be peculiarly free from dangers to navigation, and abounds with fish, including salmon and trout in the larger streams. *Saginaw Bay* affords anchorage in 9 to 17 fathoms, in *Halleck Harbour*, on the northern side of the entrance.

Kiku Strait.—See the Addenda for page 603.

Page 608.—Between Cape Bendel and Point Nepean, the sound is nearly 10 miles wide. *Turnabout Island*, 4 miles northward of Cape Bendel, is 471 ft. high, and there are some rocks on the South side of the channel between it and the shore.

Portage Bay, formerly known as *Perenosnaia Creek*, is a narrow inlet extending 5½ miles south-eastward, or to within about 4½ miles of the head of Duncan Canal. The entrance is only half a cable wide between shoals on either side, with 3½ fathoms least water, but steamers can easily enter, and find good anchorage in 5 or 6 fathoms, sand. It is high water here, on full and change, at 0h. 31m.; springs rise 16 ft., neaps 12¼ feet. At springs, the tidal streams run 5 or 6 knots an hour past the entrance.

Point Gardner is low and wooded, but rises within, and coal has been found in the hills to the northward. Whirls and tide-rips often occur here, owing to the meeting of the tidal streams, and it should not be approached within 1 mile. *Surprise Harbour* affords good anchorage in 8 to 15 fathoms, but is exposed to southerly winds. *Murder Cove* is a narrow inlet, affording good anchorage for vessels of moderate size, in 17 to 7 fathoms, mud. *Yasha Islet* is low, with some trees on it.

Point Nepean is in about lat. 57° 9′ N., long. 134° 16′ W., with rocks extending over a cable N.N.E. of it.

Eliza Harbour is an inlet extending 6½ miles N.W. by N. from Point Nepean, but *Liesnoi Island* divides the approach into two very narrow channels, in which are many sunken rocks, and the tides run with great strength. The harbour is very deep, and the only anchorage is at its South end, off the West side of Liesnoi.

Woewodski Harbour, on the N.E. side of Liesnoi, is fronted by sunken rocks, within which there is indifferent anchorage in 4 fathoms.

Pybus Bay, 10 miles northward of Point Nepean, is extensive, with numerous islets and rocks in it, with deep water between.

Cape Fanshaw is in about long. 133° 34′ W. At 11 miles eastward of it is *Farragut Bay*, with numerous rocks in it, and the only anchorage is in 13 fathoms, in its northern angle.

Page 609.—**Thomas or Wood Bay,** the large inlet eastward of Point Vandeput, has its entrance embarrassed with shoals, and possesses very grand and varied scenery, the mountains rising 2,000 to 3,000 ft. sheer from the water, while in its northern and eastern angles there are the great Baird and Patterson glaciers. The bar has from 2½ to 8 fathoms over it, and is steep-to on either side, and within it the water is very deep. The best anchorage is in the S.E. arm of the bay, in 17 fathoms, northward of Spray Islet. *Devil's Thumb Mountain*, about 21 miles north-eastward of Point Vandeput, is 9,062 ft. high, the columnar rock on it being 1,662 ft. high.

Horn Cliffs, opposite the northern entrance of Wrangel Strait (see the Addenda for page 602), are very prominent, being 1,800 ft. high, and here is a fine waterfall, where water can be obtained by boats. Two wooded islets lie 1 mile off them.

Leconte or Thunder Bay, on the northern side of the flats off the northern channel of Stikine River (see the Addenda for pages 601-602), and 10 miles eastward of Horn Cliffs, is inaccessible, being always full of icebergs, derived from the glaciers, but abounded with seals, which were hunted by the Indians. The noise of the falling icebergs can be heard miles away, and they drift out of the bay along the northern side of this part of Frederick Sound, as far as Agassiz Point.

Ideal Cove, on the southern side of the western approach to the boat channel leading to Wrangell, affords good anchorage for small vessels, in 7 fathoms.

Page 609.—**STEPHENS PASSAGE** was formerly described as subject to floating masses and fields of ice, from adjacent glaciers, but it is stated that only an occasional floe is now seen in it.

Northward of Cape Fanshaw the coast forms *Fanshaw Bay*, in which lie the Storm Islets and rocks. *Whitney Island*, low and wooded, is separated from the shore by *Cleveland Passage*, which forms an excellent harbour in its southern part, with anchorage in 9 to 20 fathoms; the northern entrance is deep, but the southern entrance is narrowed to less than a cable by sandspits on either side.

The *Five Fingers* are a group of low islets and reefs north-westward of Cape Fanshaw; *Sail Islet*, 11 miles from the cape, is about 300 ft. high, and wooded.

LIGHT.—On the S.E. islet of the Five Fingers, about $5\frac{1}{2}$ miles N.W. $\frac{1}{3}$ W. from Cape Fanshaw, stands a white dwelling surmounted by a square black tower, showing a *fixed bright* light, elevated 68 ft., and visible 14 miles. In foggy weather, a *Trumpet* sounds a blast of 5 *seconds* in every *half-minute*.

Brothers Islets, in the S.W. approach to Stephens Passage, rise to an elevation of 649 ft., and have deep water around.

Gambier Bay, on the western side of Stephens Passage entrance, extends 9 miles westward, with numerous islets and reefs in its outer part, where there is no anchorage. The inner part is also deep, and the only good anchorage is in 17 fathoms, in *Snug Cove*, its southern angle. Vessels approaching it pass close along the western shore of the entrance of the bay, within the off-lying islets, or eastward of them, and then through the narrow channel between Church Point and Gain Islet.

Pages 609-610.—**Port Houghton** is a deep inlet extending 12 miles E.N.E., and affords no sheltered anchorage. Around it the mountains rise to elevations of from 3,000 to 5,000 feet.

Page 610.—**Hobart Bay,** next northward of Port Houghton, extends about 6 miles north-eastward, and has deep water. A vessel might anchor in 10 fathoms, in the cove northward of its narrow entrance.

At $3\frac{1}{2}$ miles W.N.W. of Point Hobart are the *Twins*, two wooded islets about 240 ft. high, and at $2\frac{1}{3}$ miles S.W. $\frac{1}{4}$ W. from the western islet is the dangerous *McDonald Rock*, of $3\frac{1}{2}$ fathoms, steep-to, and lying in the fairway.

Windham Bay, $7\frac{1}{2}$ miles north-westward of Hobart Bay, extends about 6 miles north-eastward, and in the valley southward of its head is a gold-mining settlement. A group of wooded islets lies in the middle of the entrance, and at $2\frac{1}{2}$ miles within them the navigable channel narrows to about 100 yards, with 7 fathoms in it, and then opens into an inner deep basin, where there is indifferent anchorage off the mud-flat at its head. A *black can buoy* marks the end of the ledge extending from the western shore of the narrows.

SEYMOUR CANAL is really an inlet extending 35 miles N.W. by W. to its head, in lat. 58° $5\frac{3}{4}'$ N., whence there is a canoe portage, half a mile wide, to Oliver Inlet. It has deep water, and its inner part has several islands and rocks in it. Vessels can anchor in *Mole* or *Windfall Harbours*, on its western side, or higher up if guided by local knowledge.

HOLKHAM BAY is very deep, but exposed anchorage may be had in 8 to 20 fathoms, behind the islets off the East end of Harbour Island, or off Wood Spit. At Harbour Island the bay divides into two long arms, between high mountains on either side, with magnificent scenery. The water being very deep, with strong tidal currents, and floating ice from the glaciers, they are not safe for general navigation.

Endicott Arm extends 25 miles to E. by S., its entrance being only $2\frac{1}{2}$ cables wide between shoal sandspits on either side. At 4 miles within is *Sumdum Island*, on which was a gold-mining settlement, now abandoned, and southward of this is *Sandford Cove*, where a vessel might anchor in 35 fathoms.

Tracy Arm trends 9 miles N.W. by N., and then turns to E. by N. for 13 miles, and is too deep for anchorage. Its entrance is narrowed to one-third of a mile by dangers on either side.

Midway Islets lie 4 miles W. $\frac{1}{2}$ N. from *Point Coke*.

Port Snettisham is very deep, but anchorage might be found close off the drying flats in the northern and southern arms. There is a salmon cannery on the South side of the entrance, and a gold-mining camp near the N.W. point of the southern arm. *Speel River* runs into the northern arm, between high mountains, and amid magnificent scenery. *Whiting River* runs into the southern arm.

Pages 610-611.—*Point Styleman* is in lat. 57° 58¼′ N., long. 133° 53½′ W. At 4½ miles W.N.W. of it is *Limestone Inlet*, very narrow, but there is anchorage in its outer part, in less than 20 fathoms.

Page 611.—**Taku Harbour,** 2 miles W.N.W. of Limestone Inlet, is about half a mile in diameter, with an entrance nearly 2½ cables wide, and affording snug anchorage in 10 or 12 fathoms, mud, near the centre. There is an Indian village at its head. Icebergs sometimes drift into it. It is high water here, on full and change, at 0h. 27m.; springs rise 17½ ft., neaps 13¼ feet.

Grand Island lies in mid-channel, 2½ miles westward of Taku Harbour, and rises steeply to an elevation of 1,500 feet.

Slocum Inlet is too deep for anchorage.

TAKU INLET, or Tako Arm, extends 18 miles northward, and is nearly 3 miles across where widest, but near its head the channel is narrowed to about two-thirds of a mile, between shoal flats on either side. It was proposed as a good route of approach to the Yukon goldfields, but it ends in a glacier which breaks off in icebergs, rendering the inlet almost useless for navigation. There is no settlement or safe anchorage here, and the inlet is only entered by excursion steamers for the sake of the scenery. The glaciers have receded considerably since Vancouver's time. In winter, fierce gales and snowstorms sweep down the inlet.

The Indian tribes are now more civilised and under control.

Arden Point is low and wooded, and off it the northern and southern tides meet. At 5 miles S.W. of it is *Oliver Inlet*, only accessible to boats at high water. At its head is a canoe portage to Seymour Canal.

Young Bay, 14 miles westward of Arden Point, affords fair summer anchorage, but *Auke Harbour* is very shallow. There is a canoe portage to Hawk Inlet (Chatham Strait). *Skull Islet*, lying off the bay, is a bare rock 50 ft. high.

DOUGLAS ISLAND is 15 miles in extent East and West, wooded, and mountainous. The compass has been found subject to great derangement in its vicinity, in some parts.

Gastineau Channel is now much less subject to ice. It is 1 mile wide at its southern entrance, narrowing to half a mile abreast Douglas City, 6 miles within, and above Juneau navigation is impeded by flats; the passage northward of Douglas Island can only be used by boats at high water springs.

Douglas City, on the southern shore, contained 825 inhabitants at the census in 1900, and here are the famous *Treadwell* goldmines which have yielded vast wealth, though the ore is of low grade; the produce in 1904 was 3,000,000 dollars. Off it lies *Juneau Islet*, between which and the wharf there is good but contracted anchorage in 12 to 15 fathoms. There is a mooring buoy in 25 fathoms, 250 yards north-eastward of the Treadwell wharf. A vessel could be safely beached between the western end of the islet and the shore.

JUNEAU contained 1,864 inhabitants at the census in 1900, and is the headquarters of the gold-mining industry in this part of Alaska. It has hotels, etc., and is lighted by electricity. Supplies of all kinds, including water and fresh provisions (but not coal), can be obtained here, and mail steamers call regularly. When steamers are expected, a *red light* and a *bright electric light* are shown above the warehouse on the wharf. A submarine telegraph cable runs to Sitka, in connection with that to Seattle.

Vessels anchor off the mail wharf, in 20 fathoms, mud, but the S.E. winds of summer sometimes send in a heavy sea. The tides run fairly regular, and it is high water, on full and change, at about 0h. 45m.; springs rise 18½ ft., neaps 14 feet.

Above Juneau the channel is crossed by overhead telephone wires.

Page 612.—Stephens Passage, beyond Young Bay and Douglas Island, has several islands and dangers in it, but the survey shows the channels between them to be deep and easy of navigation.

Horse and *Colt Islets*, 6 to 7 miles westward of Young Point, should not be approached within a mile, as some drying rocks lie off them.

Outer Point is the western extreme of Douglas Island, and within it lies *Shaman Islet*, high and wooded. *Dornin Rock*, of 2½ fathoms, lies 4 cables S.W. of this islet; and *George Rock*, at three-quarters of a mile N.N.W. of it, is covered at spring tides.

Fritz Cove, in lat. 58° 19½′ N., long. 134° 36′ W., is easy of access, and affords excellent shelter from southerly and easterly winds, in 20 to 25 fathoms. *Portland*

Island, lying off the approach, has a drying reef extending three-quarters of a mile N.N.W. from it.

Symonds Point, 3 miles W.S.W. of Portland Island, has a reef extending half a mile from it, and on its western side is a cove affording anchorage in 10 to 12 fathoms.

Shelter Island is 8 miles in length, wooded, and 1,200 ft. high at its northern end. A reef extends half a mile off its S.E. end, and at half a mile S.E. by S. ¼ S. from the S.E. point is *Strauss Rock*, a dangerous patch with only 9 ft. over it. In fine weather, vessels might anchor off the southern side of Shelter Island.

Favorite Channel, that generally used by the mail and other steamers, passes between the N.E. side of Shelter Island and the chain of islets and reefs fronting the mainland. The principal danger is *Poundstone Rock*, a 2-fathoms pinnacle lying in the northern part of the fairway, at 1 mile S. ¾ E. from Sentinel Islet lighthouse; it is marked by a *can buoy*, painted in *red* and *black bands*, lying in 3 fathoms, off its western side, at 1 mile S. ⅛ E. from Sentinel Island. Should the buoy be adrift, vessels approaching from the northward, after passing Vanderbilt Reef buoy, should steer for the eastern edge of Shelter Islet until up to that islet, and then keep a mid-channel course down Favorite Channel. Approaching from the southward, steer a mid-channel course with Portland Island astern, until the South end of Sentinel Islet is in line with the S.E. end of Benjamin Island.

SENTINEL ISLET Lighthouse is a tower surmounting a white dwelling, showing a *fixed bright* light, elevated 82 ft., and visible 14 miles. In foggy weather, a *Trumpet* sounds a blast of 5 *seconds* in every *half-minute*.

Saginaw Channel, S.W. of Shelter Island, is deep and navigable. *Favorite Reef*, on the eastern side of the southern entrance, is marked by a *red nun buoy*, in 10 fathoms, off its S.W. edge. *Faust Rock*, of 2¾ fathoms, lying off Point Retreat, at the northern entrance to the channel, is marked by a *can buoy*, painted in *red* and *black bands*, off its eastern side.

Retreat Point, in lat. 58° 24½′ N., long. 134° 56½′ W., is low and partially wooded, and should not be rounded within half a mile.

The Lighthouse on Retreat Point is a white wooden turret, showing a *fixed bright* lantern light, elevated 13 feet.

Barlow Cove, south-eastward of Retreat Point, is 5 miles in extent, with anchorage near its head.

About 25 miles northward of Juneau is the mining settlement of *Eagle River*, 7 miles from the sea, with which it is connected by road and tramway.

Page 612.—**CHATHAM STRAIT** has not yet been completely surveyed, but is deep and clear, the shores being densely wooded below the bare mountain peaks. Between Point Gardner and Killisnoo, heavy tide-rips occur off nearly all the projecting points and reefs, sometimes to 1 mile off shore.

Hazy Islands are four in number, the southernmost and highest being about 250 feet high. They lie approximately 16 miles S.E. of Cape Ommaney, 14½ miles S.W. ½ S. from Cape Decision, and 5 miles W.S.W. of Coronation Island. Sea-birds frequent them in large numbers.

Port Conclusion, &c.—See pages 619-620.

Page 613.—**Point Gardner.**—See Addenda for page 608.

Wilson Cove, 8 miles N.W. by N. from Point Gardner, is very foul, and should not be entered.

White Water Bay has irregular soundings, but there is anchorage off its North side, in 14 fathoms, 2½ or 3 cables South of North Islet. A rocky ledge extends off *Caution Point*, on the South side of the entrance, with some rocks above water on it, and heavy tide-rips are met with here. The village is named *Neltushkin*. On the South side of the bay is *Table Mountain*, 2,438 ft. high, with a conspicuous eroded summit. It is high water here, on full and change, at about 0h. 25m.; the rise is about 16 feet.

Russian Reef lies 9 cables N.W. by N. from the wooded islet lying off *Woody Point*, the northern point of White Water Bay. It is very steep-to, and partly dries at low water.

Cha-ik Bay, northward of Russian Reef, has an Indian village on the North side of the entrance, half a mile off which are an islet and rocks. At 2 miles north-eastward of the village is a cove, with good sheltered anchorage in 12 fathoms, mud.

Warm Spring Bay, 7 miles westward of Point Gardner, is an inlet over 2 miles in extent. At its head is a waterfall above which are some hot springs, frequented by the Indians. There is inferior anchorage in 25 fathoms, rock, abreast the second bight on the southern shore, but small vessels can anchor in either of the two small bays on the South side.

Ta-Katz or *South Bay*, 4½ miles farther north-westward, is a narrow inlet, 3 miles in extent, affording landlocked anchorage in 20 fathoms, mud, in the basin just before it turns abruptly to the northward.

At 1½ mile north-westward of Ta-Katz Bay is a conspicuous waterfall, and 4 miles farther on is the South point of Kelp Bay.

Kelp Bay is a large indentation. Its northern arm runs 3½ miles westward, and is connected with Hanus Bay, in Peril Strait, by a flat covered 3 or 4 ft. at highest tides. Much cedar has been cut and rafted here. Vessels can find anchorage at the heads of the various arms of the bay, in 10 to 24 fathoms, mud.

Hood or Hootz Bay is 5 miles northward of Cha-ik Bay, and about midway between is a whitish cliff, 800 ft. high. Hood Bay has numerous rocks and reefs in its entrance. At 6 miles within, it divides into two arms, each affording anchorage in 15 to 20 fathoms, mud, near its head.

KILLISNOO ISLAND (formerly known as *Kenasnow*) is 1½ mile long, E.N.E. and W.S.W., thickly wooded, and about 300 ft. high at its western end. On the northern side of its eastern end is the settlement of *Killisnoo*, where there are extensive fish-oil and guano works, and a post-office. Here is a wharf, off which there is somewhat contracted anchorage in 13 fathoms, subject to heavy squalls when strong S.E. winds prevail, and formerly known as *Koteosok Harbour*. A reef extends north-westward from *Samuel Point*, the western extreme of the island, and its extremity is marked by a *red nun buoy;* eastward of this there is anchorage in 15 fathoms, sheltered from southerly winds, and known as *Kootznahoo Roads*.

Lights.—A *bright* lantern light is shown on a stake on the reef extending off the S.E. end of Killisnoo Island, and another on the reef extending from the N.E. end.

Lone Rock, on the eastern side of the southern approach to the village, covers at a quarter flood, and is marked by a *red nun buoy*.

In approaching Killisnoo from the West, pass northward of the buoy off Samuel Point, and of a *white beacon* marking some rocks about half a mile westward of the wharf. Westward of the wharf is a ledge, whence a rocky bar extends to the main, over which 4½ fathoms can be carried.

In approaching from the South, vessels can pass between Killisnoo Island and the low sandy *Table Islet*, and then between Lone Rock buoy and the stake on the western reef.

It is high water here, on full and change, at 0h. 20m.; the tide rises 12 ft., and the tidal streams run strongly and irregularly.

In the vicinity of Killisnoo is (or was) a successful farm, raising potatoes, turnips, peas, cabbage, beet, etc., with a few cattle and pigs.

Danger Point, in lat. 57° 30¾′ N., long. 134° 35½′ W., is a bluff wooded promontory about 500 ft. high, with a drying ledge extending 1½ cable W.N.W. from it. The village on it is now known as *Angoon*, and is fronted by an extensive reef named *Kenasnow Rocks*, partly above water, within which there is temporary anchorage, in 12 fathoms.

KOOTZNAHOO INLET within Danger Point, is very intricate, embarrassed with innumerable rocks and shoals, and the tidal streams in it sometimes run 10 to 12 knots an hour. Vessels have obtained supplies of lignite coal here, but no regular mine is yet being worked.

Peril Strait, opposite Killisnoo, is described on pages 627-628.

Between Danger Point and Cube Point, in lat. 57° 58½′ N., there is little to note, beyond what is shown on the chart. *Cube Point* is a wooded rocky bluff, with a square rock off it; a small vessel might anchor in *Square Cove*, on its N.E. side.

Point Marsden is 5 miles beyond Cube Point, and forms the eastern side of the northern entrance of Chatham Strait. In fine weather, there is anchorage in 20 to 30 fathoms, mud, in *Game Cove*, a narrow inlet extending south-eastward of the point. Small vessels can also find shelter eastward of a reef, 1 mile farther northward.

Hawk Inlet, 2 miles northward of Point Marsden, extends 5 miles N.N.W., and has good anchorage in 7 fathoms at its head. The entrance is unsafe, being narrowed to half a cable by ledges and mud-flats, and the tidal streams run strongly.

Page 614.—*Kook* or *Basket Bay*, in lat. 57° 39½′ N., extends 1⅓ mile westward, with an Indian village at its head, off which there is good sheltered anchorage in 8 to 20 fathoms.

TENAKEE, Siwash, or *Berry Inlet*, 7 miles north-westward of Kook Bay, extends about 35 miles westward, and at its head is a narrow canoe portage to Port Frederick, in Icy Strait. About half a mile northward of the southern point of the entrance is a rock covering at a quarter flood, on which stands a *barrel beacon*, rising 20 ft. above

low water. On the North side, about 8½ miles within the entrance, is a village of Hoonah Indians, where there are some hot sulphur springs.

FRESHWATER BAY, close northward of Tenakee Inlet, extends about 11½ miles westward, and its outer part is bounded on the North by *North Passage Point*, a narrow wooded projection nearly 4 miles long. At 3½ miles within East Point is *Pavlof Cove*, where small vessels can find anchorage in 15 fathoms, sheltered from southerly winds. There is also anchorage in *Wachusett Cove*, 1 mile eastward of this.

Northward of Freshwater Bay are *Iyoukeen* and *False Bays*, affording indifferent anchorage in summer. The coast is high and wooded.

Augusta Point, 4 miles north-westward of False Bay, forms the western side of the northern entrance of Chatham Strait, and lies 4½ miles S.W. of Marsden Point; it is in about lat. 58° 2′ N., long. 134° 56′ W.

LYNN CHANNEL (or CANAL) is one of the most frequented routes to the Yukon goldfields (*see Addenda for page* 454), ocean-going vessels landing their passengers and goods at Skagway, at its head, for conveyance to the interior by the railway.

Winds.—In summer, the wind blows almost constantly from the sea up Chatham Strait and Lynn Channel, which lie almost in a straight line, caused by the high mountains on either side diverting the air currents towards the axis of the channel. These currents, being heavily charged with moisture, cause frequent and heavy falls of rain or snow.

Hanus Reef lies 4 miles S.E. by E. from Point Couverden, and is marked on its eastern side by a *can buoy*, painted in *red* and *black bands*.

Couverden Island and *Swanson Harbour* are described on page 621. At 1⅜ mile N. ½ E. from Point Couverden is a rock 12 ft. high, at the S.E. extreme of a chain of rocky islets and reefs extending N.W. by W. to the shore. Between these and the rocks off Funter Bay, the southern entrance of Lynn Canal is 3½ miles wide.

Page 615.—**Funter Bay** extends 2 miles northward, and has some islets and rocks in it, but vessels can safely pass between Clear Point and Station Islet, and thence southward of Bare Islet to an anchorage in 17 fathoms, mud, off the gold-mining works on the S.E. side of the bay. It is high water here, on full and change, at about 0h. 41m.; springs rise 16½ ft., neaps 12½ feet.

Retreat Point Light and *Saginaw Channel* are described in the Addenda for page 612.

Lincoln Island, separated from the N.W. end of Shelter Island by a deep channel a quarter of a mile wide, is 4 miles in length, and well wooded. It is prolonged to the N.W. by a rocky ledge, on which lie *Ralston* and *Little Islets*.

Vanderbilt Reef, 5¼ miles S. by E. ¾ E. from Bridget Point, and 3¾ miles N. by W. ¼ W. from Little Islet, uncovers about 10 ft. at low water, and on its northern side is a *nun buoy*, painted in *red* and *black bands*.

Favorite Channel.—See the Addenda for page 612.

At 2½ miles S.W. of Bridget Point is *Mab Islet*, behind which small vessels find good anchorage in 6 to 10 fathoms, in *Bridget Cove*.

Berners Bay is 3 miles in width between Bridget Point and St. Mary Point (in lat. 58° 43¾′ N.), and extends about 5 miles northward, with extensive mud flats at its head. Vessels find temporary anchorage off these flats, or in the S.E. bight. There is a sawmill in the N.W. angle, and gold is found hereabout.

Sherman Point, 8½ miles north-westward of St. Mary Point, has a shoal spit extending upwards of half a mile westward from it, and at half a mile S.S.W. from it is *Sherman Rock*, with 6 ft. over it, marked by a *red nun buoy* on its south-western side.

Light.— On Sherman Point stands a white wooden turret, showing a *fixed bright* light, elevated 38 feet.

Seward, on the northern side of Sherman Point, is a gold-mining settlement, with some sawmills. Here and to the northward the land rises steeply in lofty mountains.

St. James Bay, westward of the N.W. end of Lincoln Island, is 1 mile wide at the entrance, and extends 4 miles north-westward, with several islands and extensive mud-flats at its head. There is anchorage in 20 fathoms, but exposed to S.E. winds. Gold-mining is carried on here.

William Henry Harbour, 7 miles S.W. ¾ W. from St. Mary Point, is only 4 cables wide, and three-quarters of a mile in extent, but is easy of access, and affords good sheltered anchorage. In 1897, there was a dangerous sunken wreck lying in the anchorage.

At 6½ miles N.W. of Endicott River is *Sullivan Rock*, 150 feet high, off the S.E. end of *Sullivan Island*. This island is 6½ miles long, and 900 ft. high; the channel westward of it is not often used.

Page 616.—**Chilcat Islands** extend 5 miles S.E. ½ E. from Seduction Point, are moderately high, and scantily wooded; at 2 miles farther on is *Eldred Rock*, about 50 ft. high.

LIGHT.—On Eldred Rock stands a white octagonal building about 60 ft. high, showing a *flashing* light every 10 *seconds*, alternately *red* and *bright*, elevated 91 ft., and visible 15 miles. In foggy weather, a *Siren* sounds a blast of 5 *seconds* in every 45 *seconds*.

In 1904, the transport *Buford* was reported, when getting under way from an anchorage, to have touched in 2½ fathoms, about 3½ cables N. 64° E. from the North point of the middle Chilcat Island, or in lat. 59° 2′ 10″ N., long. 135° 15′ 10″ W., but no bearings were taken.

CHILCAT INLET is blocked by flats 9 miles above Seduction Point. On the western side of the entrance is the *Davidson Glacier*, sloping down to a wooded projection named *Glacier Point*. Between this and a drying reef on the opposite side, the entrance of the inlet is half a mile wide. In April, 1905, Capt. Burke, of the schooner *Prosper*, reported a rock drying 2 ft. at low water, at 1¾ mile E. by N. ½ N. from Glacier Point.

At 2 miles within the entrance is *Kochu* or *Ventosa Islet*, with foul ground southward and eastward of it. At 3 miles above this is *Pyramid Islet*, 86 ft. high, and grassy, connected with the eastern shore by a drying spit, extending from the village of *Chilkat*. In fine weather, vessels can anchor on either side of this spit, but they must beware of *Jenkins Rock*, of 9 ft., lying 1¼ mile E. by N. from Pyramid Islet.

Pyramid Harbour is small, but affords sheltered anchorage. There is a village here, with a salmon cannery. It is high water, on full and change, at about 0h. 15m.; springs rise 16¼ ft., neaps 12½ feet.

Dalton's Trail to the Yukon River, by way of the Chilcat and Klaheela Rivers, is a good and easy route to or from the goldfields, and may possibly be used during winter; the land transit of about 300 miles takes two to three weeks, and this route is of less consequence since the construction of the railway from Skagway.

Page 617.—**CHILKOOT INLET** branches into two narrower arms about 13 miles within Seduction Point, Chilkoot Arm trending 5 miles westward to the village of Chilkoot, and Taiya Inlet 14 miles N.N.W. to Skagway and Dyea. The compass is liable to considerable disturbance between Portage Bay and Battery Point to the southward, the needle being sometimes deflected to the extent of as much as 2¼ points to the eastward or westward. This disturbance has been noticed to decrease gradually to the southward of Battery Point, the needle resuming its normal direction when about 4 miles distant from that point.

On the western shore, about 8 miles above Seduction Point, is *Battery Point*, a projection resembling an earthwork. Between this and the wide flats off the mouth of *Katsehin River* the channel is over half a mile wide, and the edge of the flat is marked by a *red buoy*.

Portage Bay, 2 miles westward of Battery Point, is about a mile in width, and on its western side is an Indian village, with the *Haines* mission station, stores, etc., and a wharf. There is anchorage in 8 to 10 fathoms, off the wharf, but with S.E. winds there is better shelter in 12 to 15 fathoms, on the southern side of the bay. It is high water here, on full and change, at about 0h. 29m.; springs rise 18¾ ft., neaps 14¼ feet.

Indian Rock lies in mid-channel about 1½ mile above Portage Bay, and is about 2½ cables in extent East and West, its eastern end being awash at low water springs. A *nun buoy*, painted in *red* and *black bands*, marks its southern side.

Chilkoot Arm has an Indian village at its head, off which there is anchorage in 25 to 30 fathoms, mud.

SKAGWAY, at the mouth of a stream on the eastern side of the head of Lynn Canal, contained 3,117 inhabitants at the census in 1900, but has decreased in population since the construction of the railway to the interior (see Addenda for page 454) has rendered transport more regular and easy throughout the year, and navigation is always open. There are wharves reaching into deep water, where large vessels may safely lie and discharge cargo at any time of tide, and there is anchorage off them, in from 30 to 40 fathoms, mud. Steamers call here regularly, and the usual supplies can be obtained. Skagway is connected with the telegraph system.

The railway, opened in 1900, follows the old trail over *White Horse Pass*, which is 18 miles from Skagway, at an elevation of 2,400 ft., and thence to White Horse, a distance of 112 miles altogether, where river navigation begins. From White Horse Pass the old trail leads to Lake Bennett, 35 miles from Skagway, whence the Yukon goldfields can be reached by canoe or boat, the Klondyke being over 500 miles distant. This pass

is considered easier to surmount than the Chilcoot Pass, but both are obstructed by deep snow in winter.

Dyea or Taiya, at the head of the inlet, and about 4 miles above Skagway, was of considerable importance till the construction of the railway, but at the census in 1900 the population had dwindled to 261. At low water the mud-flats dry for about 2 miles southward of it, and large vessels can anchor off them in about 28 fathoms, mud, better sheltered from southerly winds than at Skagway. Wharves, etc., were constructed here, for the use of large vessels.

The Dyea or Chilkoot Pass route to the Yukon, etc., has long been used by the Indians, and joins the Skagway trail at Lake Bennett. At 15 miles from the sea this pass attains an elevation of 3,600 ft.; and, being impassable for horses, a wire tramway was erected to haul goods to the summit.

Page 619.—**BARANOFF ISLAND** is mountainous, many of the peaks being always covered with snow.

CAPE OMMANEY.—See the Addenda for page 606.

Port Conclusion, 6 miles N.N.W. of Cape Ommaney, is about 1 mile wide at its entrance, with an islet off its southern point, and extends 2½ miles southward, narrowing to *Ship Cove* at its head. The *Albatross*, U.S.N., anchored off the cove, in 20 fathoms, rocky bottom, but the cove is narrow, with 4 and 5 fathoms water, and only suitable for small vessels.

Page 620.—*Port Alexander* is only suitable for small vessels, the narrow entrance having 4 fathoms in it, and 8 to 3 fathoms within.

Northward of Port Armstrong the coast of Baranoff Island has not been examined, and the chart is only a sketch. *Point Augusta* is described in the Addenda for page 614.

Pages 620-621.—**Siwash Channel, &c.**—See the Addenda for page 614.

Page 621.—**Point Couverden,** the S.E. extreme of Couverden Island, is in lat. 58° 11½′ N., long. 135° 3′ W. *Rocky Islet*, 54 ft. high, lies three-quarters of a mile S.E. of it, with a clear channel between.

Swanson Harbour is only suitable for small vessels; its entrance lies 1⅓ mile W. by N. ¼ N. from Rocky Islet, and is very narrow.

ICY STRAIT, the eastern part of *Cross Sound* (see the Addenda for page 624), is deep, but subject to floating discoloured ice resembling low rocks. *Porpoise Islets* lie about 20 miles westward of Point Couverden, and there is anchorage in the passage northward of them, in 10 to 15 fathoms, exposed to southerly winds.

Pleasant Island is about 7 miles long, wooded, and *Knob Hill* rises to an elevation of 880 ft., on its southern side. At two-thirds of a mile off shore, S.E. of Knob Hill, is a sunken 9-ft. reef. *Icy Passage*, northward of Pleasant Island, is rather shoal, and subject to floating ice.

Spasskaia Bay, 13 miles westward of Point Augusta, is nearly filled with a shoal bank, and some rocks lie in the approach. At 2 miles N.N.E. from its entrance is *Spasskaia Islet*, 30 ft. high, with anchorage south-westward of it, but rocks extend two-thirds of a mile south-eastward from it.

The Sisters, 5 miles N.E. ¼ N. from Point Sophia, are two wooded islets, the largest 150 ft. high. At 1¼ mile S.W. by W. from the northern point is a reef drying at low water.

Port Frederick.—In 1893, the U.S.S. *Pinta*, drawing 11⅓ ft., at low tide touched on a sunken rock on the West side of the entrance, at about 2 miles W. ½ N. from Point Sophia.

There is a mission station, with a post office, at *Hoonyah Harbour*. Small vessels anchor in 12 to 14 fathoms, between Pitt Islet and the western end of the village, but large vessels lie farther out, in 16 to 20 fathoms, good holding ground.

Page 622.—*Point Adolphus*, in lat. 58° 17′ N., is low, and wooded, and usually has much floating ice off it. In the bight close eastward of it is an Indian village, and there is good anchorage in 8 to 10 fathoms, about three-quarters of a cable off shore.

GLACIER BAY is about 4 miles wide at the entrance, and extends about 45 miles to W.N.W., with several arms. It is visited by excursion steamers, but has not been surveyed, and local knowledge is necessary for its safe navigation, there being numerous shoals in it, and it is usually full of floating ice.

In 1887, it was estimated that the *Muir Glacier*, the most imposing of the five immense glaciers at the upper part of the bay, and which has a sea-face of 1 mile, represents a body of ice measuring about 5,000 ft. wide by 700 ft. deep, entering the sea at an average rate of 40 ft. a day; at 10 miles inland it is 10 miles in width. At the time of Vancouver's survey, in 1794, the glaciers appear to have reached within 5 miles of the

entrance, having receded since that time (see "Notes on Glaciers," by Mr. O. J. Klotz, in the *Geographical Journal*, November, 1899).

The entrance points are low, and a drying reef is stated to extend nearly 1½ mile eastward from the western shore, northward of Carolus Point. About a mile southward of *Gustavus Point*, the eastern point, is *Ancon Rock*, with about 6 ft. over it, and connected with the point by foul ground.

Bartlett Bay, 5 miles northward of Gustavus Point, and on the southern side of *Beardslee Islands*, affords good anchorage in 15 fathoms, mud, the best in Glacier Bay. There is a salmon cannery here.

Steamers going to the Muir glacier usually pass in mid-channel westward of Willoughby Island, and then well westward of Marble Islets. There is anchorage close off a sandy beach at the East end of the glacier, in the stream flowing from it; or in 18 fathoms, a little lower down the eastern shore. The glacier should not be closely approached, as bergs are constantly breaking off, with a roar like thunder.

Page 623.—**Lemesurier Island** is about 4½ miles long. There is an Indian village in *Willoughby Cove*.

Dundas Bay is about 2½ miles wide at the entrance, *Dundas Point* being in about lat. 58° 19′ N., long. 136° 15½′ W.

Inian Islands form the boundary between Icy Strait and Cross Sound. Between them and Wimbledon Point the navigable channel is about 1½ mile wide, in which the tidal streams sometimes run 6 knots, causing heavy tide-rips. The passage southward of the islands is only 3 cables wide off Point Lavinia, and, being also subject to terrific tidal streams, should not be attempted by strangers.

Pages 623-624.—**Port Althorp** extends about 8 miles south-eastward from Point Lavinia, and 4 miles eastward from Lucan Point. Capt. H. H. Lloyd, an Alaska pilot, reported this harbour as good for vessels of any size, and as being easy to approach. Off the western shore, near its head, is a round wooded islet, eastward of which there is anchorage in 22 fathoms, mud.

Granite Cove is about 2 cables in extent, with anchorage in 18 fathoms, mud. The anchorage N.W. of *George Island* is not good, the bottom being very rocky; *Gaff Rock*, 130 ft. high, lies 2½ cables S.W. ½ S. from the western point of the island, with which it is connected by a reef.

Page 624.—**CAPE SPENCER** is in about long. 136° 38½′ W., terminating in a low narrow point, about 10 miles S.W. by S. ½ S. from Point Wimbledon.

Taylor Bay, between Cape Spencer and Point Wimbledon, is blocked at its head by the *Brady Glacier*, which appears to have advanced over 5 miles seaward since Vancouver's visit in 1794.

Column Point, 3 miles S.W. by S. from Lucan Point, has several pinnacle rocks off it. *Bingham Point*, 4 miles farther on, is rather low and rocky, with several rocks off it; it lies about 8½ miles S.E. ¾ E. from Cape Spencer.

Lisiansky Strait extends about 8 miles south-eastward from Column Point, and then turns to the southward for 7 miles, passing between steep and wooded shores. It is considered to be navigable, but has not yet been surveyed.

Jacobi Island is much lower than the adjacent parts of Chichagof Island, and is densely wooded. Hence to Salisbury Sound the coast has not been surveyed, and should not be closely approached.

Page 625.—**CAPE CROSS** is about 7 miles S.E. by S. from Point Bingham, and is low and wooded. Eastward of it Jacobi Island is indented by *Takhanis Bay*, which might possibly be mistaken for the southern entrance of *Lisiansky Strait*, 3 miles S.E. of it, but there are some islets off the southern point of the latter.

Cape Edward, about 17 miles S.E. by E. from Cape Cross, is the western extreme of a low wooded island. Breakers are reported to have been seen 10 miles off it, but the direction is not given. *Portlock Harbour* is probably that known to the Indians as *Kukkan Bay*.

Page 626.—To the S.E. of Cape Edward the coast is fronted by a range of islands and rocks, within which there is said to be a good channel connected with Portlock Harbour.

Page 626.—**SALISBURY SOUND**, formerly known as *Klokacheva Sound* or *Olga Gulf*, is deep and clear in the fairway. *Klokachef Island*, on the North side of the entrance, is about 1,000 ft. high; rocks extend a long way off its N.W. and S.E. ends, and at 1⅓ mile W. ¾ S. from its southern point is *Olga Rock*, usually marked by breakers. Vessels can anchor in *Leo Cove*, northward of the island, but the approaches are narrowed by reefs.

Sea Rock, off the southern entrance point of Salisbury Sound, is awash at high water, and at half a mile W. ½ N. from it is *Morskoi Breaker*.

Kalinina Bay, the narrow inlet on the northern side of Kruzof Island, is open to the ocean swell, but small vessels might find shelter at its head. *Sinitsin Islet*, north-eastward of it, is low, and between it and *Goloi Islets*, to the North, the channel is less than a mile in width. At 1½ mile farther eastward are *Samoi* or *Scraggy Islets*, whence reefs extend to the southern shore.

Page 627.—**Neva** or *Nevski Strait* is used by the mail and other steamers bound to or from Sitka, by way of Olga Strait. Several of the rocks and dangers in it are marked by *buoys* and *beacons*, but local knowledge is necessary for the safe navigation of this narrow and intricate channel.

PERIL STRAIT, formerly known as Pogibshi Channel, is largely used by mail steamers and other vessels trading to or from Sitka and the inner channels of S.E. Alaska. Local knowledge, however, is absolutely necessary for this intricate and dangerous navigation, which is aided by *buoys* and *beacons*. Ordinary steamers can safely pass through within half an hour before or after the middle of the slack. At neaps, full-powered steamers can pass at any time, if going with the stream.

At its southern entrance, Peril Strait is narrowed to 1 cable by Channel Islets, but at Sergius Narrows it is barely half a cable wide.

Tides.—It is high water, at the northern and southern ends of the narrows, at about 0h. 30m. In the narrows the tidal streams sometimes run 10 knots an hour, causing rapids, whirlpools, and eddies. Slack water lasts only about 20 minutes. The flood tide from the ocean meets that from the East at the North end of the narrows, northward of Pogibshi Point. The average rise is about 12⅓ feet.

Pogibshi Point is low and wooded, and an islet stands on the reef extending two-thirds of a mile north-westward from it. In the bight on its northern side there is good anchorage in 22 fathoms. Small vessels can anchor in *Poison Cove*, on the opposite western shore, in 18 to 20 fathoms. *Ushk Bay*, 2 miles north-westward of Poison Cove, is an inlet 4 miles long, with anchorage at its head, in 18 to 20 fathoms, mud.

Pages 627-628.—In the fairway, between Ushk Bay and Nismeni Point, are several reefs, which will be avoided by keeping near the eastern shore. There is a clear channel between *Krugloi Islets* and *Otstoia Islet*, but the steamers usually pass southward of the latter. A *red nun buoy* marks the end of the spit abreast the islet, where the channel is about a cable wide, and a *black can buoy* marks *Cozian Rock*, which lies half a mile N.E. by N. from Otstoia.

Page 628.—*Favourite Anchorage* is about a mile southward of Otstoia Islet. There is good holding ground in 17 fathoms, 2½ cables off shore, with the highest mountain peak bearing about East.

Nismeni Point is low and rocky, with drying reefs 3 and 4 cables N.E. ½ E. from it. The cove on its S.E. side has anchorage in 18 to 22 fathoms, with shelter from southerly winds.

Hooniah Sound extends north-westward from the central part of Peril Strait, and on the western side of the entrance is *Emmons Island*, the channel westward of which is not safe. It divides into three arms, at the heads of which there is anchorage, in 15 to 20 fathoms, mud.

Rodman Bay, 5 miles E.S.E. of Nismeni Point, extends 6 miles southward, and is 2 miles wide at the entrance, with irregular depths, but is much narrower within. A rock, with not more than 6 ft. over it, lies about half a mile westward of the eastern point of the entrance, and is marked by a *black can buoy*. There is good anchorage in 10 to 12 fathoms, mud, within the two islets near the head of the bay. There are some gold-mining works in the interior, connected with the bay by a tramway 7 miles in length.

In 1903, the captain of the steamer *Georgia* reported a sunken rock about half a mile westward of the eastern point of Rodman Bay entrance; in 1905, the officers of the Survey steamer *Gedney* found a least depth of 6 ft. over it, at 2½ miles S. ⅜ E. from the East end of False Island.

Sa-ook Bay, 3 miles eastward of Rodman Bay, extends 3 miles southward, and is half a mile wide. There is good anchorage in 18 to 22 fathoms, mud, about half a mile above the spit extending from the western shore 1½ mile from the entrance. There are numerous streams of good water.

Hanus Bay, 4 miles eastward of Sa-ook Bay, has some islets and reefs in it, and is not recommended for large vessels. In its S.W. angle is a fishing village, where the Indians dry salmon and trout.

Hence to Point Thatcher, the southern side of Peril Strait is fronted by wooded islets, with numerous rocks and reefs, and should be avoided.

Lindenberg Harbour is formed on the East by Lindenberg Head, a projecting point 250 ft. high, on the northern shore, opposite Hanus Bay, and affords shelter from northerly winds, but the holding ground is inferior. *McClellan Rock* is marked by a *barrel beacon*, 20 ft. high.

Fairway Islet, in the middle of the eastern entrance of Peril Strait, is a prominent mark, being about 320 ft. high, and covered with trees. A sunken rock lies two-thirds of a mile S.W. by W. ¼ W. from it, and at three-quarters of a mile eastward of the islet is *Midway Reef*, about half a mile long, and covered at high water.

Light.—On the N.E. point of Fairway Islet is a white wooden turret, showing a *fixed bright* lantern light, elevated 37 feet.

Sitkoh Bay, on the North side of the entrance of Peril Strait, is 1 mile wide at the entrance, between Point Craven and the reefs off Hayes Point, and extends 6 miles W.N.W., with anchorage in 15 fathoms, mud, off the flats at its head. At 2 miles above Hayes Point, a low wooded point projects from the eastern shore, forming a bight, in which there is anchorage in 20 fathoms, hard bottom, sheltered from northerly gales.

Morris Reef extends about 1⅔ mile E.S.E. from Hayes Point, and its extremity is marked by a *black can buoy*.

Page 628.—**CAPE EDGCUMBE,** in lat. 56° 59′ 45″ N., long. 135° 51′ 45″ W., is fronted by rocks, over which the flood tide sets strongly. *Mount Edgcumbe* is 2,855 ft. high.

Page 630.—**SITKA SOUND.** —*Vasileva Rock* is usually marked by a breaker, and lies about two-thirds of a mile S.S.E. from Neprop Islet. The *sunken rock* of 10 ft., now named *Biorka Rock*, lies about 1½ mile S.W. by W. ½ W. from the northern end of the islet off the N.W. point of Biorka, and breaks at intervals.

The outermost of the *Vasilevka Rocks* lies about 6¼ miles N. ½ E. from the islet off the N.W. end of Biorka.

Pages 630-631.—From Otmeloi Point to *Burunof Point* the bearing is E. by N. ½ N., and the distance 8½ miles. *Kulich Rock* lies 3¼ miles E. by N. ¾ N. from *Vitskari Island*, and the latter lies nearly 8 miles N.N.W. from the islet off the N.W. point of Biorka. The *beacon* on Vitskari bears a post capped by a large stone, elevated 41 ft. above high water, and is visible 11 miles in clear weather. Sunken rocks lie about a quarter of a mile N. by W. and S.W. of Kulich Rock.

Page 631.—*Pilots, &c.*—In August, 1904, Capt. D. Schierloh, of the German ship *Peru*, found there were no regular pilots here, but local steamers will tow vessels in, at a high rate. No sailing vessel should venture to approach without the aid of local knowledge. He also found no banking facilities at Sitka, and had to obtain cash for ship's expenses from Juneau.—(*Der Pilote*, 1905, Heft 25).

Makhnati or *West beacon*, 20 ft. high, is about 5⅔ miles N.E. ¾ N. from Vitskari beacon, and is painted *white*. *Makhnati Rock*, of 10 ft., a quarter of a mile southward of the beacon, is marked by a *nun buoy*, painted in *red* and *black bands*.

Eastern Channel.—Over 2 miles S.E. by E. ¼ E. from the West beacon is the *East beacon*, on the summit of the *Eckholms*, a white wooden pyramid, 20 ft. high, rising 72 ft. above high water, surmounted by a star, and the letter **E** is painted on its seaward face. *Simpson Rock*, with 17 ft. over it, lies on the North side of the entrance, and a *black can buoy* lies off its southern side. *Tzaritza Rock*, with 8 ft. over it, lies on the North side of the channel, and is marked by a *black can buoy*, lying in 10 fathoms, at about 1¼ mile N.E. by N. ½ N. from the East beacon. A 3¼-fathoms pinnacle rock lies 4 cables E. by N. from the East point of *Katz Islet*, and is marked by a *red nun buoy* on its N.W. side. Another rocky patch of 3½ fathoms lies 6 cables E.N.E. from that point.

Middle Channel.—*Keene Rock*, of 14 ft., lies 8 cables E. by N. ¼ N. from the West beacon, and is marked by a *black can buoy* on its southern side. *MitchellRock*, of 7 ft., lies on the southern side of the channel, at nearly 1¾ mile N.E. by E. ½ E. from the West beacon, and is marked by a *red nun buoy* off its N.W. side.

Western Channel.—*Channel Rock*, uncovering 5 ft., lies in mid-channel, northward of the western end of Japonsky Island, and is marked by a *barrel beacon*. A *red spar buoy* lies in 6 fathoms, at 1¼ cable N. by E. from the beacon, and over half a cable farther on is a *black spar buoy*, in 5½ fathoms, marking the North side of the channel.

At three-quarters of a mile eastward of Channel Rock the channel is narrowed to 40 yards, with a depth of 3½ fathoms in it, by a shoal extending from the coast of Japonsky Island, near the extremity of which is *Harbour Rock*, marked by a *barrel beacon*. The channel is marked by *buoys*.

There is good anchorage in 8 fathoms or less, between Channel and Harbour Rocks.

Page 632.—The best anchorage off Sitka is in 10 fathoms, about 4 cables E. by S. from the old castle headland or rock.

Tides.—It is high water at Sitka, on full and change, at about 0h. 6m.; springs rise 10 ft., neaps 7½ feet. The tides are affected by diurnal inequality, and the streams run irregularly.

SITKA contained 1,396 inhabitants at the census in 1900. By the latest U.S. survey, the observation spot is placed in lat. 57° 2′ 53″ N., long. 135° 20′ 22″ W. The old citadel was destroyed by fire in 1894. Small quantities of fresh meat and vegetables can be had here, and wood is plentiful; steamers can be supplied with coal by lighters. Fresh water is scarce, and ballast is expensive. There is regular communication by steamer with San Francisco, Victoria, Puget Sound, Ounalaska, St. Michael's, &c., and it is connected with the U.S. telegraph system by submarine cables to Juneau, Valdez (Prince William Sound), and Seattle. There is a government naval and coaling establishment on Japonsky Island. A wharf extends westward of the castle rock, into a depth of 4 fathoms.

A fixed bright lantern light, elevated 108 ft., is shown on a white framework on the castle rock, the site of the old fort.

Climate.—During observations extending over 45 years, the temperature at Sitka ranged between extremes of 88° and —4° F., January being the coldest month and August the warmest. The average annual rainfall is 81 inches, about a half falling from September to December; on an average, rain or snow falls on 200 days out of the year.

Page 634.—**Silver Bay** is a deep inlet eastward of Sitka, indenting the western coast of Baranov Island for 5 miles. At its head, about 10 miles from Sitka, are some gold-mining works, and deposits of copper ore have been found hereabout. Over the North side of the entrance rises *Mount Verstova*, a sharp rugged peak 3,216 ft. high, a conspicuous mark for Sitka Sound in clear weather.

The Coast of Baranov Island, south-eastward of Sitka Sound, is little known, beyond what is shown on the chart.

Whale Bay extends about 6 miles northward, and is continued by an arm reaching within 3 or 4 miles of the eastern coast of Baranov Island. On the eastern side of the bay are several inlets affording good anchorage. *Still Harbour*, the southernmost, has anchorage between two islets near its head. *Port Banks*, or *Closed Bay*, has two islets in its narrow entrance, and within there is landlocked anchorage in 13 to 15 fathoms.

Between Whale Bay and Red Fish Bay, 15 miles south-eastward, the coast is indented by several small bays, and lying off it are the three remarkable pinnacle rocks known as the *Kekurs*.

Red Fish Cape, forming the southern side of the entrance to Red Fish Bay, is comparatively low and wooded, terminating in several islets and rocks, at about 1 cable southward of which is a dangerous breaking rock. On *Entrance Islet*, less than 2 cables within this rock, is a white board on a tree, as a *beacon*. On the outer coast, not far northward of the cape, is a conspicuous white cliff among the trees.

At 1½ mile S.E. by E. ½ E. from Entrance Islet is *Big Branch Rock*, a high yellow islet, and at 1⅞ mile S.E. of this is *Sea Lion Rock*, a similar mass.

RED FISH BAY was partly examined by the officers of the U.S.S. *Albatross*, in 1897, and found to extend about 3 miles northward, with several rocky patches in it, and in two places the navigable channel is narrowed to 200 and 100 feet, but the water is deep. At the head of the bay is a salmon cannery, off which there is anchorage in 6 to 8 fathoms. The entrance of the bay is difficult to make out from sea, but Sea Lion and Big Branch Rocks form good marks, and the white board on Entrance Islet will assist.

Cape Ommaney.—See the Addenda for page 606.

Page 635.—**The Coast** between Cape Spencer and Prince William Sound has not been surveyed, and is but little known; the chart, consequently, must be used with great caution. It affords only two known safe anchorages, with landing all the year round, at Yakutat village and Kayak Island; though in summer, the Indians can land at Lituya Bay, Dry Bay, the head of Yakutat Bay, Icy Bay, Icy Cape, and Cape Yataga. Lieut. H. W. Seton-Karr states that eastward of Yakutat and Icy Bays there exist small plains covered with forest of spruce and cedar, but elsewhere the plains consist of bare stones covering huge glaciers. The coast-line is therefore undergoing constant alterations.*

Several islets and rocks lie off the coast westward of Cape Spencer, and about 7

* For the northern regions of Alaska much information has been published in the reports of U.S. surveyors and others, and the reader is referred to the "Compilation of Narratives of Explorations in Alaska," issued at Washington, in 1900.

miles from it is a bay, in the eastern part of which is *Murphy Cove*, a snug anchorage for small vessels.

LITUYA BAY is about 40 miles westward of Cape Spencer, and its navigable entrance is reduced to half a cable in width by projecting spits on either side, with 4 to 6 fathoms in it, at 1 cable off the eastern point. In bad weather it is closed by breakers, and La Pèrouse here lost some of his crew in 1786, commemorated by a monument on an islet about 3 miles within the entrance. In calm weather the tide causes a dangerous bore, and it is only safe to enter or leave at slack tide. It is easily made out from the sea, the Paps, two densely wooded hills on the eastern point, forming a good landmark. The anchorage is northward of the middle of the western spit, in 5 to 7 fathoms, hard sand; the rest of the bay is too deep for anchorage.

Cape Fairweather is about 15 miles W.N.W. of Lituya Bay, or in lat. 58° 49′ N., long. 137° 58′ W. *Mount Fairweather*, 15,292 ft. high, is about 15 miles to N.E. ¼ N.

Page 636.—**Dry Bay.**—The easternmost outlet of the *River Alsekh* has about 6 ft. over its bar at low water.

Ocean Cape, on the eastern side of the entrance of Yakutat Bay, is a gravel bluff about 50 ft. high, with sunken rocks around it, breaking heavily in bad weather for half a mile off.

YAKUTAT or Behring Bay is 15 miles wide at its entrance, and extends about 30 miles northward, then curving round to the long inlet named Disenchantment Bay. Shoal water extends from 1 to 2 miles off Cape Phipps, and the soundings in the entrance are irregular, several patches of 8 to 10 fathoms being shown on the chart. *Cape Phipps* is in lat 59° 33′ N., long. 139° 51′ W., and its northern angle is named *Point Carrew*. Gold is found in the sandy beaches hereabout.

De Monti Bay is entered between Cape Phipps and Point Turner, and in its eastern part forms a cove about half a mile deep, on the N.W. point of which is the village of *Yakutat*, containing 247 inhabitants at the census in 1900, with a Swedish mission station, where a few cattle are kept. There is anchorage off the village, in 17 or 18 fathoms, mud; in approaching, the shoal in mid-channel is plainly visible between low water and half-tide. H.M.S. *Hyacinth* found good anchorage in 13 fathoms, off the village, with Cape Phipps bearing S. 55° W., and Turner Point S. 85° W. Mail steamers call here regularly.

Khantaak Island, low and wooded, is about 7 miles in extent. *Point Turner*, its S.E. extreme, is in lat, 59° 34′ N., long. 139° 46′ W., and shoal water extends about a quarter of a mile southward from it.

Page 637.—**Port Mulgrave** is not suitable for large vessels. The entrance is only 70 yards wide, with not less than 7 fathoms, and the port extends about three-quarters of a mile, by over a cable wide, with depths of 7 to 12 fathoms. It is high water here, on full and change, at about 0h. 34m.; springs rise 9½ ft., neaps 7¼ feet.

Disenchantment Bay, or *Russell Fiord*, extends as an inlet about 30 miles south eastward from the head of Yakutat Bay, and its entrance is usually filled with floating ice. It is surrounded by magnificent scenery, and the largest vessels could safely use it. At the end of the eighteenth century it was closed by a wall of ice, which has retreated 5 or 6 miles since that time, and its head is now formed by the Hubbard glacier. Deposits of good coal have been found on its northern side.

Page 638.—**Point Manby** is a low wooded bluff, and between this and Icy Cape the water is often discoloured, probably by streams from the glaciers. Westward of Point Manby to Icy Cape, extends the great *Malaspina Glacier*, coming down to the sea at the Sitkagi Bluffs and Icy Cape; it is more than 70 miles in extent, and 20 to 25 miles wide, with an area over 1,500 square miles. At 3 or 4 miles eastward of Icy Cape is a sandy islet, affording shelter to the small sealing vessels from the prevailing easterly winds of summer.

ICY BAY is now merely a slender bight, the bay having been filled up by débris brought down by the *Yahtse River*. *Icy Cape*, the extremity of the Guyot Glacier, consists of ice cliffs about 300 ft. high.

Page 639.—**MOUNT ST. ELIAS** was found by the Boundary Commission, in 1892, to be in Canadian territory, its summit being elevated 18,017 ft., in lat. 60° 17′ 34½″ N., long. 140° 55′ 19½″ W. Its summit was attained for the first time on July 31, 1897, by the Italian Prince Luigi Amedeo di Savoia,* who ascertained the elevation, by

* For a sumptuously illustrated English translation of the account of this expedition, the reader is referred to "The Ascent of Mount St. Elias," as narrated by Dr. Filippo de Filippi, 1900.

mercurial barometer, to be 18,060 feet. No traces were seen of any volcanic action, as reported previously. It has been seen from sea when 150 miles distant. About 17 miles to the north-eastward of Mount St. Elias is *Mount Logan*, rising to an elevation of 19,512 ft., and about 2 miles from this is another peak, elevated 19,276 feet.

Mount Logan was considered to be the highest peak on the North American continent, but has had to yield precedence to *Mount McKinley* (*Bolshaya*, of the Russians), which attains an elevation of 20,464 ft., in lat. 63° 5′ N., long 151° W., northward of Cook Inlet.

Pamplona Rock was carefully searched for, but in vain, by the U.S. survey steamer *Hassler*, in 1892, no trace of any danger being encountered. Sealing and other vessels also report having seen no indication of such a danger near the charted position. In 1892, however, tide-rips and discoloured water were reported in the vicinity of lat. 59° 6′ N., long. 142° 41′ W.

Cape Yaktag is about 18 miles westward of Icy Cape, and petroleum has been found in the vicinity.

Page 640.—**Cape Suckling** is now considered to be in about long. 144° 20′ W. About 4 miles to the southward and westward of it are two shoals usually marked by breakers. Hereabout patches of white water have been seen 3 miles off shore.

Page 641.—**Kayak Island** has two trading stations on it, frequented by sealers and otter-hunters. *Cape St. Elias* or *Hamond* has a reef extending many miles southward of it, on which, at about 6 miles from the cape, stands a flat perpendicular rock, 500 or 600 ft. high. Great caution must be exercised when navigating in this vicinity. A rocky ledge is reported to lie 3½ miles S.W. ⅜ S. from the cape, on which the barque *Sea Ranger* was lost in 1893.

A sunken danger is reported to lie about 11 miles W. by S. ¼ S. from Cape St. Elias.

Page 642.—**Wingham**, *Mitchell*, or *Little Kayak Island*, has a settlement named *Kayak* on the S.E. point, which is connected with Kayak Island by a bank having 19 feet over it, inside which there is good anchorage. The tide rises 9 feet.

Comptrollers or Controller Bay, the wide bight westward of Cape Suckling, is full of shoals, and strangers should not venture to pass between it and Kayak Island without local knowledge. The coast is well wooded, and petroleum is found here, numerous wells having been sunk near the northern coast, between the mouth of *Behring River* and the settlement named *Katalla*, about 4 miles westward of the bay. Deposits of good coal have been found up Behring River, at from 12 to 25 miles from the coast.

COPPER RIVER has a course of about 300 miles, terminating in an extensive delta, fronted by broad mud-flats, and is of little use, being shallow, with many rapids. The tidal currents run swiftly, and the channels between the flats are only navigable by boats drawing not more than 3 or 4 ft., and in places only at high water. The delta is subject to violent winds from September to early spring. On the western side of the entrance of the western branch of the delta is the village of *Alaganik*.

MIDDLETON ISLAND was examined by U.S. officers in 1892, when the S.E. point was found to be in lat. 59° 24′ N., long. 146° 20′ W. It is used as a preserve for blue foxes, in charge of a few settlers. It is about 5 miles long, and 1¼ mile wide near the South end, its central and highest part being elevated 140 feet. Hence it declines towards the North to a long sandspit, dry at low water. It is surrounded by kelp and foul ground, and is covered with grass and bushes, the resort of wild geese, ducks, and sea-birds. Breakers are said to extend more than 10 miles off its southern end. There is good anchorage off two small huts about the centre of the West side, and thence to the South end extends an unbroken line of dark boulder clay cliffs about 100 ft. high. On the East side the cliffs are from 30 to 50 ft. high.

Fountain Rock is variously reported to lie 2½ to 5 miles northward of the North point. A rock, on which the whaler *Northern Light* struck in 1882, lies nearly 4 miles S. 32° E. from the S.E. point of the island.

Sea Otter Reef.—Capt. Simmons, of the barque *Northern Light*, stated that this reef lies about 19 miles N. by W. ⅞ W. from the North point of Middleton Island; it is about 2 miles long, East and West, awash at low water, and breaks heavily. Overfalls were also seen 6 or 8 miles eastward of this reef.

In 1893, a sunken reef was reported to lie nearly midway between Middleton Island and Cape Hinchinbrook, in lat. 59° 50′ N., long. 146° 30′ W., about half a mile long, East and West, and sometimes breaking.

The tidal streams hereabout ran 2 to 3 knots an hour, the flood setting to the N.E., and the ebb to the S.W.

Pages 642-643.—**PRINCE WILLIAM SOUND** has not yet been surveyed, but additional information has been gained from the recent visits of U.S. surveyors and

mining and other explorers. It is but sparsely inhabited; the natives (mostly Aleuts) number about 300, and are a peaceful race, among whom a few whites have settled. The climate generally is mild and wet, and the lower ground well timbered. Fish abounds, and copper and gold are found in the vicinity; copper works have been established at *Ellamar*, between Port Fidalgo and Port Valdez.

In approaching or leaving the sound, steamers with local aid can use the channel westward of Montague and Green Islands, all the dangers being reported as visible, but sailing vessels are recommended only to use the channel between Hinchinbrook and Montague Islands.

Page 643.—**Hinchinbrook Island** is mountainous, and was covered with snow at the beginning of June. *Cape Hinchinbrook*, a gently sloping ridge, is considered to be in long. 146° 40′ W. *Seal Rocks*, about 7 miles S.S.W. of this cape, are two bare blackish rocks, about 40 ft. high, surrounded by numerous small rocks extending about 1½ cable off. A reef extends about 1 mile to N.E. by N., and heavy breakers have been seen extending 1½ mile to the eastward and southward. Consequently, they should be given a wide berth.

Pages 643-644.—**Port Etches** is safe of approach, and vessels may take up anchorage as convenient, the usual berth being with Phipps Point bearing W. ½ N. In severe gales, a line of breakers extends from Porpoise Rocks to Fort Point. On the latter is the trading settlement, known as *Nuchek*, which contained 144 inhabitants at the census in 1900, and the Russian fort no longer exists. No supplies could be obtained here, but wood and water were plentiful. Boats approach it from the northward, by way of Constantine Harbour, the least depth in the entrance channel being about 9 feet at low water. A spit of shingle, elevated about 35 ft., connects the village with the shore to the westward, and forms the southern boundary of the harbour.

Page 644.—*Phipps Point* is now considered to be in about lat. 60° 20′ 45″ N., long. 148° 37′ 40″ W.

Hawkins Island is divided by a boat passage leading into Port Cordova from the central part of its South shore, and has three small islands off its N.E. end.

Cordova Bay, between the northern side of Hawkins Island and the mainland, is deep, with several rocks and islets in it, and local knowledge is requisite for its safe navigation. Vessels bound here, from off Port Etches, usually steer N.W. by N. ½ N. for *Knowles Head*, the black bluff between Port Gravina and Port Fidalgo. When about 6 miles from it, they alter course to N.E. by E. ⅝ E. for the northern side of the bay, avoiding the Hawkins Island shore, until well within the bay.

Orca, about 10 miles northward of Cape Witshead, is a salmon cannery settlement, and about 4 miles southward of this is another cannery at *Odiak*. Vessels bound here usually pass through the 19-ft. channel between Hawkins Island and the island off its eastern end, and then feel their way with the lead. There is anchorage off them in 6 to 8 fathoms.

Page 645.—**Port Gravina.**—The S.E. point of the entrance is now considered to be in about long. 146° 30′ W., and is said to have many islets and rocks off it, but they were not seen from the U.S.S. *Albatross* in 1897. There is good anchorage between it and a low wooded island 2 miles to the N.W. of it.

Port Fidalgo is reported to be full of shoals. In 1905, Capt. Knudsen, of the steamer *Portland*, stated he struck on a 3-fathoms pinnacle rock in *Landlocked Bay*, in about lat. 60° 50′ 53″ N., long 146° 31′ 32″ W.

Bligh Island is about 5 miles long, and off its N.W. end is *Fox Island*, and there are many islets and rocks between these and the mainland, on which is the copper-mining settlement named *Ellamar*. Fox Island was used as a breeding place for blue foxes.

PORT VALDEZ has recently come into notice as being the best route to the United States Copper River and Yukon territory, to which a road is now being constructed from the settlement of *Valdez* at its head, and a railway is proposed. It is accessible at all seasons, ice only being formed near its head in the depth of winter. It is very deep, and the best anchorage is in 30 fathoms off the flats at the entrance of *Lowe River*, running into its head. Steamers call here regularly, and it is connected with Seattle by a submarine telegraph cable, viâ Sitka.

PORT WELLS has been examined, and found to extend about 40 miles northward, dividing at its head into two arms, each terminating in glaciers, which are very numerous lower down. About half-way up is *Harriman Fiord*, extending 15 miles southward, with glaciers on either side. *Passage Canal* is now known as *Portage Bay*, and has several good anchorages in it; its head is separated from the head of Turnagain Arm (Cook Inlet) by an isthmus about 5 miles only in width, occupied by glaciers, and connecting Kenai Peninsula with the main.

Page 647.—**Latouche Island** has some deposits of copper ore on it, and some amount of mining has been done here.

MONTAGUE ISLAND is very high and mountainous. *Cape Cleare* is now considered to be in about long. 148° 1′ W., and off it are several large rocks, with a reef extending about 1¼ mile southward of it. Rocks and foul ground extend 2 miles off the N.W. point of the island, and an islet lies off the N.E. point. The western bay at the N.E. end affords good anchorage. *Wooded Islands*, about 17 miles north-eastward of Cape Cleare, extend about 7 miles along the coast, and attain an elevation of 130 feet. They should be given a berth of at least 2 miles.

In 1903, the steamer *Jeanie* (drawing 13 to 15 ft.) was reported to have struck on a sunken rock about 8 miles S.W. by S. ½ S. from the largest Wooded Island, and 3½ miles off shore.

The coasting steamers use the channel between Montague and Green Islands, although it is reported to be full of rocks. There is said to be good anchorage in the northern part of *M'Leod Harbour*.

Hanning Bay is not recommended as an anchorage.

Page 649.—**Chiswell Isles.**—The southern *Seal Rock* is now considered to lie in about lat. 59° 33′ N., long. 149° 34′ W.

In 1890, there was a small settlement named *Lowell* in *Resurrection Bay*, the only one between Cape Puget and Cape Elizabeth. There is now a settlement here named *Seward City*, whence a railway is being constructed into the interior. The wharf has a depth of 30 ft. alongside. Hence there is a trail to the gold-mining settlement named *Sunrise City*, in Turnagain Arm, Cook Inlet.

The South end of the southernmost *Pie Island* is now considered to be in about lat. 59° 20′ N., long. 150° 30′ W.

Point Gore is now placed in about lat. 59° 12′ N., long. 150° 58′ W.

CAPE ELIZABETH is now considered to be in about long. 151° 52′ W. *Chugatz Islands* are high, and generally topped with snow, the lower parts being wooded: they appear to be safe of approach to 1 mile distant, but, in 1905, a reef was reported to extend southward from their southern point.

Page 650.—**COOK INLET** has attracted considerable attention of late years, owing to its fisheries, petroleum fields, and the lignite coal deposits on Kenai Peninsula, seams 2 to 7 ft. thick appearing on the surface, and gold has been found in Turnagain Arm. The following information is gained from the reports of the U.S. surveyors, and of captains of vessels who have visited its shores.

Northward of Anchor Point, the eastern shore is low, with many lakes and rivers, and with an unbroken line of uniform flat bluffs, 110 to 160 ft. high, as far as Cape Kussilof, where there is a break, and then the bluffs become lower as far as Kaknu River, when they again become higher. Near Cape Douglas the coast is also low and flat, but to the northward the western shore is mountainous, the lower slopes being wooded, but between the West and North Forelands it becomes again low and flat.

In summer, clear warm weather prevails, a great contrast with the rainy weather then experienced in Prince William Sound. In winter, the upper part of the inlet is closed to navigation by ice. In the upper part of the inlet, the water is of a whitish colour, with yellowish patches during flood tide.

Tides.—The tidal streams run from 1½ to 2½ knots an hour, the main stream of flood setting parallel with the eastern shore until deflected by the East Foreland towards the opposite coast. The ebb runs stronger near the West shore, and there is said to be a constant southerly set off Cape Douglas. At Kussilof River the tide rises from 18 to 28 feet.

Directions.—By keeping 5 miles off the eastern shore, as far as the East Foreland, a vessel will clear all dangers. Northward of Kalgin Island, the lead should be kept constantly going, as shoals are continually forming or altering. If bound to the upper part of the inlet, cross from under the East Foreland to the West Foreland; either may be approached to a distance of about 1½ mile. Round the West Foreland and haul for the North Foreland, keeping on that side of the channel from which the tide sets. From North Foreland a course N.E. ¼ E. carries to the islands off Point Mackenzie.

In the upper part of the inlet, sailing vessels must anchor near the shore when the tides are unfavourable.

Barren Islands lie over towards the N.E. side of the entrance, and are seldom topped with snow. The passage between them and Chugatz Islands is preferable to that westward of them. Heavy tide-rips are formed westward of *Amatuli*, the eastern island, and a shoal is reported to lie 5 or 6 miles E. ¾ S. from it.

Flat or *Magnet Islet* lies northward of *Point Bede*, and tide-rips have been seen 1¼ mile off it, near a depth of 30 fathoms.

Pages 650-651.—**Graham** or *English Harbour* has a trading settlement on its southern shore. On the North side of the entrance are some abandoned coal-mines.

Page 651.—**Chesloknu Bay,** 7 miles N.E. of Dangerous Cape, is a narrow inlet, which can be entered by vessels drawing 12 ft., and has a shingle beach in its inner part, where they could be cleaned or repaired. On its eastern side is the fishing village of *Seldovia*, with trading stations. Vessels anchor off the village in 7 or 8 fathoms, sand.

Page 651.—**KACHEKMAK or Chugachnik Bay** is described as one of the best harbours on the Alaskan coast, and seldom or never obstructed by ice. Several seams of lignite coal, up to 4 ft. thick, have been found here. At springs the tide rises about 30 feet.

Coal or *Entrance Point* is a long low spit of gravel, said to be extending southward, and near its extremity is the village of *Homer*, with a post-office. Vessels should not anchor off it in less than 8 fathoms. *Archimandritof Rocks*, lying to the south-westward of Coal Point, are reported not to exist as shown on the chart.

In 1898, the steamer *Perry* obtained 60 tons of coal from the bluff between Coal Point and *Bluff Point*. The latter is high and perpendicular, and between this and *Anchor Point*, a low sandy projection 12 miles to the W.N.W., kelp extends 4 miles off shore. To the S.E. of Anchor Point is a village, from which a rocky shoal extends about 3½ miles to S.S.E.

Page 652.—Between Anchor Point and Cape Kussilof, rocks extend 1 to 2 miles off shore, uncovering at low water. *Munina*, or *Ninitchik*, is a village 22 miles northward of Anchor Point; two reefs extend 2 miles off it, and there is good anchorage between them.

Kussilof River, 18 miles beyond Munina, has a village with some salmon canneries at its entrance, off which *Karluk Shoal* extends for several miles, partly drying at low water, and curving towards the shore on either side. In 1896, a barrel *buoy* was placed on its outer edge. *Cape Kussilof*, to the S.W. of the river entrance, is not a prominent mark, but at 8 miles southward of it are three conspicuous rocks, 20 ft. high, called the *Sisters*. In September, 1897, the U.S. surveyors on the *Albatross* recommended vessels coming here to stand in for the cannery buildings bearing E. by N., and to anchor 3 to 4 miles from them, allowing for 30 ft. or more as the range of tide. Hence a staked boat channel, dry in places at low water, leads in to the mouth of the river. The *Albatross* found 2½ fathoms at 6 miles W.N.W. of the canneries. In 1895, Capt. Salvesen, of the steamer *Jennie*, reported having sounded on a 3-ft. pinnacle rock, nearly 6 miles W. by N. ½ N. from the canneries.

Kenai (or *Fort Nicholas*) had 290 inhabitants at the census in 1900, and here are salmon canneries and missionary and trading stations. It is fronted by reefs, and the products of the canneries here and at Kussilof are taken by steam launches to vessels lying in Tuxedni or Snug Bay opposite for shipment.

Cape Douglas is now considered to be in about lat. 58° 54′ N., long. 153° 15′ W. On its northern side is a cove, with anchorage in 2 to 5 fathoms, on its western side.

Kamishak or *Bourdieu Bay*, the large bight westward of Shaw and Augustine Islands, is shallow, and should only be used by small vessels. Sunken rocks appear to lie between these islands, so that vessels entering should either pass southward of Shaw Island, or northward of Augustine Island. There is a village at *Portage*, in its N.W. angle.

AUGUSTINE ISLAND, also known as *Ouchouganat*, *Chernobura*, or *Black Fox*, is a conical active volcano, about 3,000 ft. high, which had a violent eruption in 1889. Its upper part is usually snowclad, and its lower grounds barren or sparsely wooded. Its summit, which emits clouds of vapour, is now considered to be in about lat. 59° 23′ N., long. 153° 31′ W. Anchorage was found in 3½ fathoms, sand, about a mile off shore, north-westward of the low southern point, and here is the best landing for boats. The island shown on the chart, north-westward of the peak, is reported not to exist.

A rocky patch, partly awash at half-tide, lies 7 miles S.E. of the peak, and about 4 miles farther out are the *Sea Otter Rocks*, said to be awash at high water, and their exact position is doubtful.

Page 653.—*Enochkin Bay*, northward of Augustine Island, is a long narrow inlet, affording safe anchorage, and petroleum is found along the coast between this and Chinitna Bay, wells having been sunk at *Oil* and *Dry Bays*, two small bights eastward of Enochkin Bay.

Chinitna Bay, 11 miles S.E. from Iliamna Volcano, is a shallow bight, protected by a reef and islets extending from its southern point. There is a small otter-hunting

village here. Hence to Kalgin Island the coast is fronted by extensive banks and shoals, some drying at low water, within which is a deep channel.

Page 653.— *Iliamna* or *Iliaminsk Volcano* is active, and rises to a sharp peak, in about long. 153° 0′. Brown bear and deer abound in these regions.

Chisick Island, about 16 miles northward of Chinitna Bay, is over 2,000 ft. high, and terraced in its upper part; off its western end is a high rocky islet, forming a good mark in foggy weather for vessels bound to Tuxedni Harbour.

Tuxedni or Snug Harbour, south-westward of Chisick Island, is an inlet 5 or 6 miles long, free from dangers, forming a spacious sheltered anchorage near its head, in 18 fathoms. The vessel loading the products of the Cook Inlet salmon canneries lies here in summer. The scenery around is very fine, the shores being cliffy, and backed by the peak and glaciers of Iliamna Volcano. There is no bar at the entrance, but tide-rips are met with, owing to the great range of the tide, varying from 24 to 36 feet. The narrow entrance is southward of Chisick Island, the approach northward of that island being encumbered by reefs.

In 1895, Captain Salvesen reported that the 4-fathoms shoal, charted 5 miles south-eastward of Chisick Island, does not exist, he having frequently steamed over this area, and found depths of 17 to 19 fathoms. He also could not find the 5-fathoms shoal shown 6 miles farther southward.

If bound to Chinitna or Snug Harbour, keep South of the parallel of Anchor Point, hauling up to the western shore when Iliamna Volcano bears N.W. by N., keeping to the westward of the banks, and using the lead constantly.

Eastward of a line between Chisick and Kalgin Islands, and about midway, is an extensive drying sandbank, said to be extending southward, with shoal ground between it and Kalgin.

Kalgin or *Coulgiac Island* is very low and wooded, with some islets off its northern end. Shoals extend 7 miles northward of it, about 3 miles off its eastern shore, and far to the S.W. of it.

Redoubt or Burnt Mountain, 11 miles westward of Point Harriet, rises to an elevation of 11,270 ft., and is an active volcano, its summit being somewhat flat. In January, 1902, it gave vent to a furious eruption, and another eruption occurred in the following May.

Redoubt Bay is the bight between Harriet Point and the West Foreland ; its shores consist of low beaches, and near its centre a large glacier descends to the sea. Its northern angle is occupied by wide shallow flats, and here is the small village named *Ḳustatan*.

West Foreland, in about lat. 60° 43′ N., long. 151° 49′ W., consists of wooded bluffs about 50 ft. high, with some rocks off it.

In May, 1896, Capt. Lundquist, of the steamer *Albion*, anchored in 10 fathoms, sand, poor holding ground, northward of the West Foreland, and found the tidal stream running 8 or 9 knots an hour.

Between the *East* and *North Forelands*, the greater part of the area is occupied by an extensive shoal, which is extending westward, with a clear channel on either side. The channel near the western and northern shore forms *Trading Bay*, on the North side of which is the village of Tyoonek.

Page 654.—**North Foreland**, in about long. 151° 8′ W., consists of whitish gravel bluffs, fronted by scattered rocks, and terminating in a gravel flat, where is the village of *Tyoonek*, inaccessible in winter, as the inlet here freezes over. Wood and fresh water are scarce here. Coal exists in the vicinity. About 2 miles above the North Foreland is *Ladds Station*, where salmon is salted. The tides here range between 25 and 35 feet.

Between the North Foreland and Point Possession, in about mid-channel, is a large shoal flat, several miles in extent.

Sushitna River runs into the northern angle of Cook Inlet, through a delta bordered by extensive mud-flats, drying nearly 10 miles off at low water, and here the tide rises over 30 feet. The mud is so sticky that a boat grounding on it may be swamped by the incoming tide. The entrance is tortuous, and can only be safely entered by boats with local knowledge, when the tide has risen. It is usually closed by ice between October and April. There is a trading station about 23 miles up it.

Sushitna River has a course of about 200 miles, and a powerful steamer not drawing over 2 ft. might ascend it for about 140 miles, but it is filled with islands and shifting sand-bars. Inferior coal exists in places, and traces of gold have been found on its banks. On the western side of the delta *Mount Sushitna* rises to an elevation of 5,500 ft., forming a conspicuous landmark.

Turnagain Island, now known as *Fire Island*, is high, and here there is good sheltered anchorage.

Knik River or *Inlet*, within Fire Island, extends about 25 miles northward, and has a trading station near its head.

TURNAGAIN ARM is embarrassed with shoals, and quite unsafe for navigation, the tide here rising from 30 to 60 feet, and running 5 to 7 knots, causing dangerous rips, and sometimes coming in as a "bore" from 2 to 10 feet high. It is enclosed by steep wooded mountains, and on its southern side is the gold-mining settlement named *Sunrise City*, whence there is a trail to Resurrection Bay. The greater part of the arm is uncovered at low water, drying for a distance of 22 miles from its head.

Point Possession is low and wooded, and vessels entering must keep it well aboard. A dangerous rock, drying at half-tide, lies in mid-channel, 1½ mile E. by N. ⅝ N. from Point Possession. Captain Lundquist found good anchorage in 6 fathoms, close to the beach, just eastward of this point, out of the run of the tide. Drift-ice was seen here, in May, 1896. In anchoring, the great range of the tide must be allowed for.

Pages 655-656.—**KODIAK ARCHIPELAGO.**—The climate is mild enough to allow the rearing of cattle and sheep, and the raising of potatoes. The shipment of ice has been discontinued. Gold deposits have been found and worked at the western end of Kodiak Island and at Uyak Bay.

Portlock and Albatross Banks are the wide bank of soundings fronting the eastern shores of the Kodiak Archipelago, and they abound with fish, chiefly cod, halibut, and red rock-fish. The bottom consists of sand, gravel, and broken shells.

Page 656.—**Shuyak Island,** the northernmost of the group, is low and wooded; it appears to have rocks extending 5 miles off its northern side, and is separated from Afognak by a narrow strait, only navigable at slack tide.

Afognak Island has been set aside as a forest reserve. It has numerous outlying rocks around it, and off its northern end lies *Sea Otter Islet*, surrounded by breakers to at least 2 miles distant. In the bay westward of *Tonki Cape*, the N.E. extreme, sealers find good anchorage, and obtain supplies of wood and water. The only permanent settlement is at its southern end, where there is a trading store, &c. *Marmot Island*, lying eastward of Afognak, is high and flat, with rocks extending off its North end to abreast Tonki Cape. The strait between the S.W. coast of Afognak and *Raspberry Island* is not navigable, but vessels with local knowledge can pass through *Usinska Narrows*, southward of Spruce Island, and thence southward of Whale and Raspberry Islands into Shelikof Strait.

Ougak or *Ugak Island* has three small peaks, and is reported to lie about 1½ mile south-eastward of its charted position.

ST. PAUL HARBOUR, being easy of access, is a great rendezvous for sealers, and there is regular communication by steamer with Sitka and Unalaska. Small quantities of coal may sometimes be obtained here, but provisions were not to be had. Large vessels can go up to the wharf. Fish abounds in the harbour, but is said to be unwholesome. Small vessels can haul up on the beach in the inner harbour. At the census in 1900, the population numbered 341.

The western point of Chagavka Cove is now considered to be in long. 152° 17′ 30″ W.

Page 657.—*Long Island* has steep rocky cliffs, and its summit is covered with trees. It is used for pasturing cattle, and breeding the blue fox.

Williams Reef lies about 3¾ miles N.N.E. from the North end of Long Island. *Hutchinson Reef* is reported to be actually part of the reefs about *St. George Rock*, and charted about half a mile S.E. of its proper position.

Humpback or *Sugarloaf Rock* consists of two or three small rocks, with one large one, said to be only 6 ft. above high water; they appear as one from the S.W. or N.E. At three-quarters of a mile S.S.W. of it is a rock, awash at low water, and 1¼ mile farther on is *Kalisin Reef*, awash at high water.

Directions.—The southern approach to St. Paul Harbour is the better. The North channel is good in clear weather, but Williams and Hutchinson Reefs make it dangerous in thick weather. Vessels should not attempt to pass between Williams Reef and Long Island.

Pages 657-658.—In entering the harbour by the *North Channel*, it is said that all dangers will be avoided by keeping the sea-front of the village just open of the land. In ordinary weather, Williams Reef appears to be the best mark for making it. Passing at 1 mile to the northward and westward of it, steer for the Channel Rocks, changing course when the strait between Near and Kodiak Islands is open, which leads to the wharf.

Barometer Mountain, about 4½ miles south-westward of the village, is 2,310 ft. high,

with two peaks, and three dark fissures on its eastern side. By keeping the light cliffs at the N.E. end of Near Island (below the dark wooded summit) just open southward of the summit of Barometer Mountain, about S.W. $\frac{5}{8}$ S., will lead clear between Williams and Hutchinson Reefs into the roadstead.

If coming from the southward, it is best to make for Ugak Island, though in any but thick weather Cape Chiniak or Greville, with its outlying rocks, is unmistakable, and gives the best bearings for making the outer Humpback; in fair weather, a peculiarly shaped ridge on the mainland, called the Devil's Thumb, if brought over the southern end of Long Island, will lead to it.

In entering by the *South Channel*, Barometer Mountain bearing about W. by S. will lead clear of the outer and inner Humpback Rocks. When the outer Humpback bears about South, distant 1 mile, a course West, passing half a mile southward of the inner Humpback, clears the Chalk Patch. When the strait between Wooded and Long Islands is closed, change course to N. $\frac{1}{2}$ W., steering for the white church near the western point of Wooded Island. When almost up with this point, which is marked by kelp, steer N. by W. $\frac{1}{2}$ W. for a few huts on the beach of Kodiak Island, and anchor in about 14 fathoms.

Off the western side of Wooded Island, to the S.W. of the Russian church, is a dangerous network of lost anchors and chains. Strong tide-rips and eddies also render this anchorage an undesirable one.

Page 659.—**Cape Greville** or *Chiniak* is low and broken, backed by pineclad hills and sharp snowy mountain peaks, and dark rocks extend about 2 miles northward of it. *Ugak* or *Igatskoy Bay*, or *Eagle Harbour*, has the native settlement of *St. Orlovsk* on the South side of the entrance, and canoes can pass hence to the northern arm of Kiliuda or Kiluden Bay.

Sitkalidak Island is separated from Kodiak by a narrow strait, the eastern part of which is not safe for vessels drawing over 8 ft., without local knowledge. A breaking rock lies over 1 mile northward of *Cape Barnabas*. There is a settlement in *Port Hobron*, the second bay inside Cape Barnabas, and here is a good harbour for vessels of any class, with fresh water in abundance from a mountain stream.

Old Harbour, on the Kodiak shore, in lat. 57° 11′ N., long. 153° 13′ W., affords anchorage in 7 fathoms, off the salmon-fishing village named *Nunamiut* or *Three Saints*, which can be safely approached by keeping in mid-channel. About 4 miles farther southward, with *Lisianski Bay* lying between, is *Three Saints Bay*, with the village of *Ziatitz* on the South side of the entrance, and subject to furious squalls.

Kiyavak Bay, situated southward of Three Saints Bay, is said to have several anchorages in it.

Alsentia Bay, westward of Two-headed Island, has a village at its head, with good anchorage off it, but N.E. winds send in a heavy sea.

Geese Islands lie off the southern end of Kodiak, the channel between being unsafe, but between the western island and Cape Trinity is *Russian Harbour*. A rock lies about 2 miles north-eastward of the eastern island. *Sitchinak Strait* separates these from Trinity Islands, and tide-rips are met with in it; in mid-channel, depths of 12 to 17 fathoms will be found, giving the Geese Islands a good berth.

In 1894, the U.S.S. *Ranger* sounded in 15 to 21 fathoms, sand and rock, on a bank lying from 21 to 30 miles eastward of Sitchinak Island.

The U.S. authorities report that the coast and islands hereabout are 5′ westward of the positions shown on the British charts.

Sitchinak Island consists of two parts, the western low, and the eastern much higher. It is surrounded by foul ground, except on the North side, and some small rocks lie about 1 mile E.N.E. from its East end. Coal has been found in a lagoon on its N.E. side, where boats can load it from the beach.

Tugidak Island is low and marshy, and heavy breakers are reported to extend 12 to 15 miles off its eastern side, and a breaking shoal about 10 miles south-westward from its southern end. A dangerous sunken rock is to be said to lie at least 7 miles West of its South end.

Alitak Bay has a large salmon cannery a few miles northward of *Akhiok*, the village at its entrance. *Cape Alitak*, on the West side of the entrance, is a peninsula with a high double peak, with anchorage in 9 fathoms, sand, 3 miles to S.E. by E. $\frac{3}{4}$ E. Northward of it is the inlet known as *Lazy Bay*, which can be safely entered by steering N.W. $\frac{1}{2}$ N. for a conspicuous dark peak, 1,010 ft. high, on its northern side, and anchor as convenient, in 15 fathoms and under. Good water is plentiful. *Olga Bay* is the head of a long inlet on the N.W. shore of Alitak Bay, and has a salmon cannery at its N.E. end.

KARLUK.—*Cape Karluk* rises abruptly to an elevation of 1,600 ft., and there is a busy settlement on the spit at the mouth of the river, with large salmon canneries, it being the most important fishery in Alaska. About 3,000,000 salmon are dealt with here annually. Mail steamers call regularly in summer.

There are no known dangers off Karluk. The anchorage off it is an open roadstead, unsafe in bad weather, especially with on-shore winds. There were two mooring bucys, in 15½ and 18½ fathoms, and vessels may anchor between them and the shore, in 12 to 14 fathoms. It is high water, on full and change, at about 0h. 37m.; springs rise 9¼ ft., neaps 7 feet.

Between Karluk and Uyak Bay there are said to be no dangers at 1 mile off shore. At about 7 miles northward of Karluk is *Cape Uyak* or *Seven Mile Point*, a sloping rocky projection.

UYAK BAY extends nearly 30 miles south-eastward, reaching within 8 miles of Old Harbour on the S.E. coast, and gold-mining is carried on here. It has several good harbours, and on the southern side of the entrance is *Harvester Island*, 840 ft. high, off the South end of which there is good anchorage in 10 to 15 fathoms, where vessels find shelter when forced to leave Karluk. Strangers should approach it by passing eastward of Harvester Island, as the channel between it and the shore has some rocks in it. There are two salmon canneries on the shore, off the South end of the island.

Larsens Bay, about 5 miles southward of Harvester Island, is an inlet extending 4 miles S.W. A sunken rock lies in the entrance, and within this the channel is narrowed to about 1 cable, between shoal flats on either side, with depths of 5 to 8 fathoms. There is a salmon cannery on the North shore, off which there is good sheltered anchorage.

Cape Ugat, about 14 miles northward of Harvester Island, terminates in a low rocky shelf, off which lies a high conical grass-topped islet, with a small rock lying farther out.

UGANUK BAY is a deep inlet, terminating in three arms, with mountainous land around. The western arm insulates Uganuk Island, but it is said only boats can pass through. On the West side of the bay, about 5 miles up, is the native village of *Uganuk*, fronted by the high rocky *Village Islets*. To the S.E. of these, on the North side of the entrance to East Arm, is *Uganuk Spit*, a wide shingle beach at the base of some bluffs, with a salmon cannery on it, and enclosing a lagoon. There is anchorage in 14 to 16 fathoms, mud, about one-third of a mile southward of the cannery, off the outlet to the lagoon; there is better anchorage a mile farther in, in 8 to 10 fathoms. The climate here is wet, and in winter the S.W. winds are very violent.

Page 660.—**Cape St. Hermogenes.**—In 1905, a dangerous reef was reported to extend about 10 miles eastward from the eastern point of Marmot Island.

Shelikof or Chelighoff Strait.—From Cape Douglas south-westward, the coast of the mainland has the appearance of a rugged chain of mountains, rising abruptly from the sea, indented by numerous bays and inlets, and fronted by many rocks and a few islets.

About 20 miles S. ½ W. from Cape Douglas is the off-lying island of *Kiupalik*, on an inlet westward of which is the village of *Kaguyak*, or *Douglas*. At 16 miles beyond this is the projection named *Cape Nukhshak*, on the South side of *Hallo Bay*, from the head of which there is a portage to *Lake Naknek*. At 4 miles south-westward of the cape is the native fishing village of *Kukak*; much salmon is caught in the inlet or bay to the S.W. of it.

At 25 miles S. by W. from Cape Nukhshak is *Takhli Island*, in front of *Amalik Harbour*, where there is sheltered anchorage in 10 fathoms, sand. Seams of brown coal have been found here.

Katmai, 14 miles westward of Takhli Island, is the largest permanent settlement on this part of the coast, and is situated up a small salmon river, whence there are trails to *Lakes Naknek* and *Becharoff*. Traces of coal and petroleum have been found hereabout. Hence to Wrangell Bay, about 80 miles to the S.W., there are no permanent settlements, but the bays are frequented by fur-hunters.

Cold Bay, or *Poualo*, extends about 10 miles N.W., the entrance being about 5 miles wide, but narrowed by rocks extending several miles off the eastern point, and a detached patch lies nearly in the middle. Within *Cape Yablek* or *Aklek*, the western point, is a small spit of shingle, at the foot of high rocky bluffs, off which there is anchorage in fine weather. There is also anchorage off a stream on the N.E. shore, but in other parts of the bay the water is deep. The head of the bay is in about lat. 57° 47½′ N., long. 155° 28′ W., and about 12 miles distant from *Lake Becharoff* or *Nanouantoughat*.

Petroleum is found in the region around Cold Bay, and between this and Portage Bay, wells having been sunk near the former.

Pages 661-664.—**BEHRING SEA and STRAIT** were first navigated by the Russian explorer Deshneff in 1648, Behring's subsequent voyage being in 1728.

ALASKA PENINSULA and the ALEUTIAN ISLANDS are mostly treeless and grassy, but willow and alder are found in places. Coal exists on either side of the peninsula, and in the eastern Aleutian Islands, and has been worked at Amalik Harbour, Unga, Chignik Bay, and Herendeen Bay. Our knowledge of these desolate regions has been increased by the recent explorations made by U.S. surveyors and others, but the charts must be used with caution.

Page 665.—At 12 miles beyond Cold Bay is *Portage Bay*, nearer Lake Becharoff. Westward of this bay are Becharoff and Kialagvit Bays, fronted by islets and rocks. There is a trail to the lake from *Kanata*, at the head of Portage Bay.

Kialagvit Bay has not been surveyed, and the chart is very inaccurate. It has deep water in it, but the entrance has only 2 or 3 fathoms in it, northward of the eastern islets, but westward of these there is stated to be a deep and clear channel in. *Olai Volcano* rises over its western end, and large glaciers descend from it. There is a trail hence to Ugaguk River, on the northern side of the peninsula.

Becharoff Bay is clear of danger in its central part, but the water shoals for 2 miles off the village.

Wrangell Bay lies 22 miles southward of Kialagvit Bay, and here is a fishing and trading village, where the schooners put in for fresh bear or deer meat.

Sutwik Island, midway between Wrangell and Chignik Bays, is described as being low.

Nakchamik Island, lying off Chignik Bay, is hilly, and covered with grass, and southward of it is *Rocky Islet*, high and bold. *Atkulik Islet* is similar in character to this islet, but has a high rock off its S.E. side. Vessels bound to or from Chignik Bay should pass southward of these islands, as there is foul ground northward.

Chankliut Island, southward of Castle Point, appears like three islands when seen from the North ; the eastern and central parts appear generally flat, while the western part is conical.

Tuliumnit or *Castle Point*, the southern limit of Chignik Bay, is a conspicuous landmark, being a rugged mass of rocky towers and pinnacles. Westward of it is the deep bight known as *Castle Bay*, said to afford anchorage on its N.W. side. Caribou deer abound hereabout.

CHIGNIK BAY is a large open bight about 70 miles south-westward of Wrangell Bay, and has not been surveyed. Its southern shore is high and bluff, and near its western part is *Anchorage Bay*, extending about 1¾ mile southward by 1 mile in width, deep and clear. Southward of the shingle spit, on the eastern side of this bay, are two salmon canneries, off which there is anchorage in 15 to 18 fathoms, but the strong winds often cause vessels to drive, and heavy gales make it very uncomfortable, and sometimes unsafe. *Doris* or *Mud Bay*, 1 mile westward of Anchorage Bay, has anchorage in its entrance in 6 to 8 fathoms, but becomes very shallow within.

Westward of Doris Bay is a high bluff, at the entrance to *Chignik Lagoon*, which has a depth of 22 ft. at high water, deepening within ; here are some salmon canneries. *Chignik River* runs into the head of the lagoon, and is ascended for several miles by a light-draught steamer, to obtain coal for the canneries.

Between Tuliumnit Point and Kupreanof Point, about 61 miles to the south-westward, the coast is much indented, with several off-lying islands, and affords anchorage in some parts. *Mitrofania Island* lies about midway between these points, and has a a village on it. In August, 1892, the *Weniaminof Volcano*, to the N.E. of Ivanof Bay, was in eruption.

Kupreanof Point, or *Cape St. John*, is high and rugged, forming a good landmark, terminating in perpendicular cliffs of basaltic rock, and pinnacle rocks extend 1 mile eastward of it. The summit is often covered with fog.

Page 665.—**SEMIDI or Evdokeef Islands** consist of two large islands and several islets, separated by a channel 5 miles in width. *Aghiyuk*, the N.W. island, is about 1,500 ft. high, and there is said to be good anchorage off its East and West sides ; its northern end is now considered to be in lat. 56° 15′ N., long. 156° 53′ W. *Choweit*, the S.E. island, is about 1,200 ft. high, with good anchorage under the N.E. end and on the N.W. side. These islands are used for breeding blue and black foxes.

Lighthouse Rocks, about 26 miles S.W. by S. ½ S. from Choweit Island, appear to cover a space of about 2½ cables, the largest reaching an elevation of 90 ft. ; they are frequented by sea-lions.

Pages 665-666.—**CHIRIKOF or Oukamok Island** is mountainous in its southern part, sloping gradually towards its northern end. Its western point, in about lat. 55° 49′ N., long. 155° 43′ W., has a round rock two-thirds of a mile westward of it, and *Nagai Rocks* are said to extend several miles off the western shore. There is anchorage in 6 or 7 fathoms, sand, about two-thirds of a mile south-eastward of the West point. Vessels can also anchor northward of Nagai Rocks, and off the N.E. end. There is foul ground off the eastern side, and breakers have been seen 3 miles East of its centre.

In 1905, Capt. Lindberg, ship *Star of Russia*, reported that a sand-flat, covered with boulders, extends about 3½ miles north-westward from the northern end of Chirikof Island, with some rocks on its outer edge just awash at low water.

Between Trinity Islands and Cape Kupreanof, there is a general southerly or south-westerly set, varying from a quarter to three-quarters of a knot an hour.

Page 666.—**SCHUMAGIN ISLANDS,** like the rest of this region, have not been carefully surveyed and other dangers probably exist besides those shown on the chart. Gold is now being mined on Unga. These islands are fronted by a wide bank of soundings, abounding with fish. In 1893, Capt. Gaffney, reported having often fished on a small rocky 27-fathoms bank, lying 15 miles E.N.E. from the summit of Simeonoff Island, and a 23-fathoms patch is reported to lie 1½ mile farther eastward. In 1892, Capt. Applegate reported a 7-fathoms shoal to lie with that island bearing between W.N.W. and N.W., distant 20 to 35 miles.

Pages 666-667.—**UNGA, or Ounga.—Zachareffskaia Bay**, indenting the northern side of Unga, has depths of 12 to 4 fathoms in it, and northward of the western point of the entrance is *Gull Islet*, about 60 ft. high, forming a good mark. At the head of the bay is *Round Islet*, 427 ft. high, forming *Coal Harbour* within it, where there is anchorage in about 6 fathoms. Wood and water are abundant here.

Page 667.—**Delaroff Harbour** is a shallow inlet at the S.E. end of Unga, which will admit vessels drawing not more than 12 ft., and there is good anchorage. Here is a fishing village, with a store, and the Apollo gold-mining settlement in the vicinity; the population numbered 175 at the census in 1900. The outer bay is very unsafe in S.E. gales, the anchorage here being in 3½ to 5 fathoms, sheltered by the reef extending off the southern point.

Popoff Strait, between Unga and Popoff Islands, is safe of approach from the southward, while Unga Reef, Popoff Reef, and the 15-ft. patch lying between Unga Reef and Range Island, make the northern entrance somewhat difficult.

Humboldt Harbour, or *Sandy Point*, is on the eastern side of Popoff Strait, at the N.W. end of Popoff Island, and here is a fishing village, with a custom-house and post-office. There is regular communication by steamer with Sitka and Ounalaska, and coal may sometimes be obtained here. There is good sheltered anchorage here in about 8 fathoms.

Light.—A local firm exhibits a *fixed* light on the North side of the harbour, showing *bright* over Sand Point, between S. 12° W. and S. 28° W., and *red* over the fairway and Unga Reef between S. 28° W. and S. 86° W.

Directions.—In coming from the East, the U.S.S. *Mohican* passed *Castle Island*, which is about 500 ft. high and rugged, at a distance of 2 miles, and then laid the course for *Wedge Cape*, a low sharp point. Rounding this at 1 mile distant, alter course to S.W. ¾ S. to pass half a mile eastward of the *Haystacks Islets*, and when the easternmost islet bears N.N.W., steer S.W. by W. ½ W. to pass 1 mile South of *Popoff Head*, a high rounded projection. A W. ⅛ S. course hence will lead southward of Egg Islands, and on the northern shore will be seen a reddish-yellow cliff, the eastern point of *Red Cove*, where there is a fishing village.

Pass about 7½ cables westward of Egg Islands, and then steer for a small building on Sand Point. Give this point a berth of 2 cables, and then steer for the white buildings at the North end of the harbour, which will clear *Caton Shoal* (of 14½ ft.), and the rocky 2½-fathoms patch. Anchor as convenient, not less than 2 cables from the wharf.

Scotland Rock, lying in the channel between *Karpa* and *Korovin Islands*, is usually marked by breakers. *Korovin Strait*, between Korovin and Popoff Islands, is deep and clear, and so also is *Gormans Strait*, between Korovin and Andronica Islands.

NAGAI ISLAND.—*Sanborn Harbour*, the inlet on the N.W. coast, affords sheltered anchorage, but vessels should not anchor in less than 10 fathoms, in its eastern angle, whence the depth shoals very rapidly. Very strong squalls occur here. On the N.E. side of the entrance is *Porpoise Harbour*, where there is a fishing station.

Mist Harbour, at the eastern end of Nagai, is entered by a channel about 100 yards

in width, with 15 to 27 fathoms in it, with a low shingle spit on either side. Within it opens to an area about 1 mile in length, varying from 1½ to 3½ cables in width, with depths of 30 fathoms or more in its central part.

Spectacle Island, between Nagai and Big Koniushi, is reported to have its South end shown 2 miles too far southward on the chart; *Peninsula Islet* is placed too far to the N.E.

Sandy Cove, in *Little Koniushi Island*, is 1 mile in width, and affords good anchorage, except with S.E. winds, in 9 fathoms, sand, in the S.W. angle.

Page 667.—**Portage Bay** is the deep inlet in the coast northward of Unga Island. its head being separated from Herendeen Bay, on the North coast of Aliaska Peninsula, by an isthmus 3 or 4 miles in width, and it was proposed to construct a railway over this to the coal mines, now abandoned (see the Addenda for page 686). In its upper part is *Albatross Anchorage*, with depths of 9 fathoms and under, sandy bottom.

The COAST, to the S.W. of Portage Bay, has not been examined, and the chart is a mere sketch, and must be used with extreme caution.

It is deeply indented by *Pavloff*, *Cold*, and *Marshovo Bays*, besides which there are numerous other smaller bays, as shown on the chart, in most of which there is anchorage. Fronting this coast is a wide bank of soundings, on which lies an archipelago of high islands and numerous islets and rocks, not yet closely surveyed, within which local vessels pass. The usual route is to pass northward of Gull, Jude, Wosnessenski, Ukolnoi, Dolgoi, and Goloi Islands, then through the narrow 8-fathoms channel between the Iliasik Islands, and northward of Deer and Umga Islands, to about 1½ mile off Cape Pankoff. The passage northward of Iliasik Islands can only be used by boats.

Cape Aliaksin, 6 miles south-westward of Portage Bay, is low and rocky, and must not be approached within 1 mile. Between this and Seal Cape, about 17 miles south-westward, the coast forms *Beaver Bay*, apparently free from danger; *Otter Bay*, opening into its central part, has not been examined. There is good anchorage in 5 to 8 fathoms, well protected from northerly winds, about 1 mile off shore, midway between Otter Bay and *Seal Cape;* the latter has rocks and reefs extending off it, terminating in a round islet. On the N.W. side of Seal Cape is *Coal Bay*, where anchorage may be found. *Broad Cape*, 4 miles westward of Seal Cape, is a high black bluff, with reefs extending about 2 miles westward from it.

Bay Point, at the N.W. end of Unga, is a steep rocky cliff, with a flat grassy summit, forming a good landmark. *Jude Island*, about 8 miles south-westward of it, is about 100 ft. high and conical.

Wosnessenski Island is high and grassy, its eastern end being formed of high steep bluffs. Between it and *Ukolnoi Island*, westward of it, are numerous rocks and foul ground; the latter island has a rugged peak near its northern end.

Pavloff Bay is exposed to gales, and is avoided even by the otter-hunters. Within its western coast is *Mount Pavloff*, an active volcano, which was in violent eruption in August, 1886.

Bear Cape is a perpendicular dark bluff; it has some low columnar basalt cliffs at its eastern part, and in coming from the West the rugged *Aghileen Pinnacles* (on the western coast of Pavloff Bay) here come into view.

Bluff Cape, the N.W. extreme of *Dolgoi Island*, is a series of low dark rocky bluffs. Close off the western side of Dolgoi is *Goloi Island*, terminating at its northern end in a spit of sand and shingle, and a similar spit extends from *Moss Cape*, on the opposite side of the channel.

Iliasik Islands are high, the inner island consisting of two hills connected by low grassy land, thus appearing like an island when seen from a distance eastward or westward of it. The narrow passage between the islands appears clear in mid-channel, with visible rocks on either side.

Cape Belkoffski, westward of the inner Iliasik, is surmounted by a high hill with a bare gray summit. A low bluff extends eastward from it to a bend in the shore-line, where is the native village of *Belkoffski*, containing 147 inhabitants at the census in 1900, mainly engaged in hunting sea-otters. The anchorage is open between S.E. and S.W., and the best for a stranger is in about 10 fathoms, with the church bearing W.N.W. The village is fronted by a beach of sand and boulders.

Bailey Harbour affords secure anchorage in 5 to 8 fathoms, within a wide spit of shingle extending from the western shore.

Deer Island Passage is deep. *Bold* or *Pillar Cape*, on the North side, is hilly with a bare red summit, terminating in steep rocky bluffs. *Deer Island* is high, and has a triangular red cliff at its northern end. Violent squalls sometimes blow off the land hereabout.

On the West side of *Thin Point*, the low West point of the entrance of *Cold Bay*, is a wide cove, where salmon canneries have been established.

Umga Islet, about midway between Thin Point and Cape Pankoff, is about 150 ft. high, with a flat summit sloping northward.

Page 668.—**SANNAK ISLAND** has several peaks in its northern part, but the rest of it is low. Its highest peak, elevated 1,850 ft., has been seen when 65 miles distant. A considerable cod-fishery is carried on here, and there are several settlements. *Acherk Harbour*, at its N.W. extreme, is safe with all but N.W. winds, and there is a village here, with a wharf.

Foul ground is reported to extend far to the S.W. of the reefs southward of Sannak, and two isolated sunken rocks, named *Anderson* and *Lenard*, are reported to lie about 25 miles S. by E. ¼ E., and about 33 miles S. by W. ¼ W., respectively, from Mount Sannak. These were unsuccessfully searched for by the U.S.S. *Albatross*, and others have reported them as not existing in their assigned positions.

Aleks Rock, a small breaking patch, is reported to lie about 19 miles S.W. of Mount Sannak.

Consequently, a wide berth should be given to these islands on their southern and western sides.

ISANOTSKI STRAIT, or False Pass, is only navigable in its northern part by the small local schooners, but its southern part will admit vessels of any size. It has been used by vessels of light draught, bound to the Yukon for service on that river. In its southern entrance it is only 2½ cables wide, and the tide here runs from 7 to 9 knots, causing whirls and eddies; spring tides here rise about 5½ feet. The flood is stated to set northward for 15½ hours, and the ebb southward for 8½ hours, the longest slack being at high water.

Ikatan Bay, fronting the South end of the strait, affords good anchorage for vessels detained by tide or fog. With northerly winds, in a cove close West of Ikatok Point, on its South side; and with southerly winds, in 8 fathoms, West of Sankin Islet, on the North side. Both these anchorages are out of the strong tidal streams. The latter anchorage is off the Palisade Cliffs, over which *Sentinel Peak* rises to an elevation of 2,012 feet.

Vessels bound in can anchor in 10 fathoms off Cape Pankof, should the weather be foggy. In approaching the strait, steer to pass between *Sankin* (a round-topped islet) and the bluffs northward of it, in 6 to 8 fathoms, thus avoiding the strong tidal currents in the bay. In passing through the strait, keep about mid-channel.

On the eastern shore, about 7 miles within the southern entrance of Isanotski Strait, is the village of *Morzovhoi*, where there is a trading store, and fresh water can be obtained. There is anchorage off it in 4½ fathoms, mud, with the church bearing about East. There are some hot springs a few miles northward of the village.

Page 669.—**The ALEUTIAN ISLANDS** rise from the sea in steep grassy slopes, bare of trees, the higher peaks being covered with snow all the year round. The climate is far from pleasant, being windy, chilly, and damp, the average annual rainfall being estimated at about 120 inches. Fog is very prevalent. Easterly and S.E. winds bring the worst weather. No cereals will mature on these islands, but the potato is grown in small quantities, also radishes, lettuce, cabbage, and turnips. In June and July, the hill-sides are carpeted with wild flowers.

The native population of these islands only numbers about 1,000, engaged in fishing, and hunting the seal and otter, Unalaska being the chief centre; it is quickly decreasing in numbers, owing to disease, etc. Wild dogs, foxes, and reindeer abound.

Page 670.—**UNIMAK** was formerly uninhabited, the Aleuts standing in superstitious awe of its active volcano. The *Shishaldin Volcano* is a regular snow-clad cone 9,385 ft. high, constantly emitting a column of vapour. The double peaks of *Mount Isanotski*, eastward of it, are elevated 8,138 and 8,058 feet. *Pogromnoi Volcano*, near the western end, is about 6,500 ft. high, and not always active.

Cape Pankoff, the eastern extreme of Unimak, is a high bluff, with three rugged points close together, and rocks extend about 2½ cables eastward of it. The tides here set eastward and westward, 1 to 2 knots an hour. In approaching from the N.E., the water shoals gradually towards it, from 18 and 20 fathoms to 8 and 10 fathoms, forming a good guide in foggy weather.

East Anchor Cove, to the N.W. of Cape Pankoff, has good sheltered anchorage, in about 5 fathoms. In approaching, beware of a pinnacle rock (barely awash at low water) lying about 3½ miles N.E. by N. ¾ N. from its entrance.

West Anchor Cove, about 3 miles westward of Cape Pankoff, has good anchorage near its centre, in 5 to 9 fathoms.

Lords or *Dora Harbour*, 7½ miles westward of Cape Pankoff, is open to S.W. winds, but affords sheltered anchorage during northerly winds, in 5 fathoms. Off it lies *Bird Islet*, a conical rock about 750 ft. high, connected by a reef with the western point of the harbour.

Otter Cove, the bay on the southern side of the Ikatan Isthmus, is said to afford anchorage.

Cape Lazaref is a rocky projection, rising inland to an elevation of 1,100 ft., with a rocky ledge extending about 1 mile S.E. from it, on which three rocks appear above water. There is good anchorage in 4 or 5 fathoms, in the slender bight on the N.E. side of the cape. Westward of Cape Lazaref is a long sandy beach, and about 8 miles from the cape is a black and rugged lava flow. At the western end of this sandy beach is a headland about 350 ft. high, with anchorage on either side. At the base of Shishaldin Volcano was the small fur-hunting settlement named *Morshovia*, in 1899.

Cape Khituk, or *Seal Cape*, the southern extreme of Unimak, is a rocky cliff about 150 ft. high, and at 1 mile eastward of it is a conspicuous steep hill about 700 ft. high. About 5 miles westward of it are some reddish gray bluffs, with a pinnacle rock at their foot known as the *Scotch Cap*.

LIGHT.—About 2 miles eastward of the Scotch Cap is a white wooden dwelling, surmounted by a tower, 35 ft. high, showing a *fixed bright* light, elevated 90 ft., and visible 15 miles. In foggy weather, a *Whistle* sounds a blast of 5 *seconds* in every *minute*.

Cape Sarichef, the western extreme of Unimak, is comparatively low, with some rocks off it, around which the tidal currents run strongly. Hereabout the snow-clad heights of Pogromnoi Volcano form an impressive scene; it is the landmark for making Unimak Pass.

LIGHT.—On Cape Sarichef stands a white octagonal building, surmounted by a tower, about 40 ft. high, showing a *fixed bright* light, elevated 126 ft., and visible 17 miles. In foggy weather, a *Siren* sounds *two* blasts of 3 *seconds* in 11 *seconds*, and is then silent 49 *seconds*.

Page 671.—**North Coast of Unimak.**—See the Addenda for page 685.

Pages 671, 677.—**FOX ISLANDS PASSES** are the three navigable channels between Unimak and Unalaska, for vessels of deep draught bound to or from Behring Sea, known as Unimak, Akutan, and Unalga. In approaching them from sea, the islands form good marks, but in summer the higher peaks are usually obscured by clouds. In coming from the South or East, the change in the colour of the water on the bank of soundings, from dark blue to light green, will prove a valuable guide in thick weather, and great attention must then be paid to the lead.

The tidal currents in and near these passes are strong and uncertain in direction, and affected by the prevailing winds. The ebb sets southward, and the flood northward, usually 3 or 4 knots an hour, but in Unalga Pass it has been known to run about 7 knots. Unimak Pass is comparatively free from tide-rips, but, in the northern approaches to Unalga and Akutan Passes, strong northerly or N.W. winds cause heavy rips.

Southward of Unimak Pass a westerly current has been observed, running 2 to 4 knots an hour. On May 22, 1904, when the U.S.S. *Petrel* was on Davidson Bank, southward of Unimak Pass, the current was found setting 3 knots an hour to West, the ebb then running through the pass. About 10 hours later, the same set was experienced by the U.S.S. *Saturn*.

UNIMAK PASS, being the widest and clearest channel, is the one most used, especially in thick weather, and should be invariably taken by sailing vessels. The recent establishment of lights and fog signals on Unimak will greatly assist vessels in its navigation.

Steamers bound to or from Unalaska will find Akutan and Unalga Passes a more convenient and shorter route, but they are narrow.

Akutan Pass, between Akutan and Unalga, is about 3 miles across in its narrowest part, and is clear of danger in mid-channel, but has islets and rocks on either side. In bad weather it breaks right across. Tigalda Island and the volcano on Akutan form good marks in approaching it or Unalga Pass.

Unalga Pass, between Unalga and Unalaska, is about 1 mile wide in its narrowest part, and is clear, with depths of 25 to 35 fathoms in mid-channel, but is subject to occasional heavy squalls. The tides here run with great rapidity, averaging 6½ knots; it is, consequently, advisable to use this channel only at or near slack water.

The passage westward of Ugamok Island is thought to be clear, but all the other minor passes between the *Krenitzin Islands* have rocks and reefs in them, and should be avoided.

Ugamok Island is rugged, with bold rocky bluffs, and rises at its eastern end in a conical sharp peak, about 1,000 ft. high.

Tigalda Island consists of high rounded hills, and should not be closely approached; its centre is in about long. 165° 22′ W.

Avatanak Island is hilly and rugged, with a bold cliff at its eastern end. The western end is low, and has a pile of rocks on it resembling a ruined castle. *Aektok* or *Rootok*, westward of it, is high and bold.

Akun.—On the N.E. side is *Akun Cove*, large and easy of approach, but subject to heavy squalls; driftwood was plentiful here. There is anchorage near its head, in 7 to 10 fathoms.

Akun Strait, between Akun and Akutan, is said to be available for small vessels.

Page 672.—**Akutan** rises to an elevation of 4,100 ft., and the rugged summit of the volcano is usually obscured by clouds or smoke. *Cape Morgan*, its S.W. extreme, is high and precipitous, with some rocks off it. The North side of the island is also steep and cliffy. On the N.E. side is *Akutan Harbour*, an inlet about 1 mile wide, with depths of 19 to 25 fathoms, but subject to squalls; there is a village and store here.

Unalga Island is comparatively low, but conspicuous, with red cliffs. The opposite coast of Unalaska has dark cliffs, with a bright red horizontal vein in them. Off the N.E. side of Unalga are the *Gull Rocks* above water.

Pages 672, 674.—**Ugalgan** or *Egg Islet*, about 550 ft. high, lies off the North end of Biorka or Spirkin Island, with a depth of 35 fathoms between. About half a mile N.W. of it is *Old Man Rock*, about 60 ft. high, a good mark in thick weather.

The two low rocks, about 3 miles southward of Egg Islet, are known as the *Signals*, and there is a depth of 10 fathoms in the channel between them and the coast.

Page 672.—**UNALASKA ISLAND** is mountainous and of very irregular outline; in its northern part *Makushin Volcano* rises to an elevation of 5,474 ft., but is now nearly extinct. The S.W. extreme is considered to be in about lat. 53° 19′ N., long. 167° 44′ W., and Cape Kalekhta, at its N.E. end, in lat. 54° 1′ N., long. 166° 23′ W.

Pages 672-673.—**UNALASKA BAY** extends about 11½ miles southward, its shores generally mountainous and cliffy. The fairway appears to be free from dangers, and those near the shores are marked by kelp. The part westward of Amaknak Island is deep, and has no good harbour. The bay is always open to navigation, and ice rarely drifts in from Behring Sea, though it may freeze to a limited extent in the sheltered parts in winter.

Cape Kalekhta is about 500 ft. high, its extremity having a conical peak on it, and should not be approached within 1¼ mile. *Priest Rock* is about 80 ft. high, and is only easy to distinguish when seen clear of the land.

Cape Cheerful, or *Wessiloffsky*, consists of bold lofty rounded headlands, intersected by deep valleys, and is safe to approach. The cascade is 225 ft. high, and is a useful mark in thick weather.

Amaknak Island rises to an elevation of about 1,650 ft., terminating at its northern end in *Ulakhta Head*, 972 ft. high, with a flat top, forming a good landmark for the bay. Breakers have been seen in heavy weather about 1 mile northward of the head.

Page 673.—**Iliuliuk Bay** has general depths of 7 to 17 fathoms, with deeper water off Dutch Harbour entrance. A ridge of irregular soundings, with a least depth of 7 fathoms, extends across the entrance between Pinnacle Rock, on the South side of Summer Bay, and the spit on the East side of Dutch Harbour. There is anchorage anywhere, as convenient, but the usual anchorage is at its head, in 14 to 16 fathoms, mud, and even with northerly winds but little sea comes in.

DUTCH HARBOUR is about half a mile wide at its entrance, and within vessels can anchor as convenient, in 14 to 19 fathoms, but strong winds cause violent williwaws here. On *Spithead*, the South extremity of the spit enclosing the northern part of the harbour, stands a wooden *beacon*, painted in *black* and *white bands*, in latitude 53° 53′ 56″ N., long. 166° 30′ 58″ W. The reef extending off the South point of the harbour is marked by a *black can buoy*, in 6⅔ fathoms, off its extremity.

On the southern shore of Dutch Harbour is *Udakta*, where are some warehouses and stores, off which a wharf extends into 25 ft. water. Coal is stored here in large quantities, and can be supplied by a 60-ton lighter, or at the rate of 150 to 250 tons a day to vessels lying at the wharf, where there is a fresh water hydrant. Ships' stores and provisions can be obtained here, and fresh meat occasionally. Small repairs can also be effected.

UNALASKA or Iliuliuk, at the southern end of Iliuliuk Bay, had 428 inhabitants at the census in 1900, and U.S. government officials are stationed here. There are

stores and warehouses, and at the western end, inside the harbour, is a wharf, reaching into 32 ft. at low water, where vessels can lie alongside, and obtain coal and water if necessary. It is a busy place in summer, and steamers call here regularly. The annual rainfall here is 92 inches, mostly in autumn and winter.

Iliuliuk Harbour is a landlocked basin, 4 cables in extent by 1½ to 2½ cables in width, with depths of 6 to 13 fathoms, over soft mud. In bad weather, however, it is dangerous to lie here, as violent squalls descend from the surrounding hills. The entrance passes between the reef extending off Amaknak and the middle of the village, and is only about half a cable wide, and this is still farther narrowed by *Tuscarora Rock*, of 3 fathoms, lying on the northern side of the fairway. This rock, and the fairway channel entrance, are usually marked by small cask *buoys*; depths of 7½ to 10 fathoms will be found into the harbour.

It is high water here, on full and change, at about 3h. 50m.; springs rise 3 or 4 ft. and neaps 2¼ ft., but there is a large diurnal inequality; the extreme range observed was 5 feet. The tidal streams are weak.

Directions.—*In foggy weather*, vessels bound to Unalaska, from the South or East, are advised to use Unimak Pass, and take a departure from Cape Sarichef lighthouse, first steering about 25 miles north-westward to avoid the tidal inset into Fox Islands Passes. Then alter the course to the S.W., for about 50 miles, so as to gain a position about 10 miles westward of the meridian of Cape Cheerful, about 8h. a.m. Then carefully steer for the coast, the water being very deep, and if it be not sighted, and the sea smooth, send a boat ahead within hailing distance.

About 3 miles westward of Cape Cheerful is *Wislow Isle*, with a rounded summit, easily made out, and eastward of this the formation of the land resembles a dry dock, with three peaks on the western side. Cape Cheerful can be rounded closely, and, when the cascade is made out, shape a course for Ulakhta Head, and thence proceed for Dutch Harbour or Iliuliuk.

If the land be made near Akutan Island, *Flat Top Point*, on its N.W. side, forms a good mark, there being a narrow vertical cleft near its extremity, open when bearing between South and S.S.W. Give a berth of at least 1½ mile to Cape Kalekhta, the shoals off which will be cleared when Priest Rock and the shore line to the southward are in line, but it is advisable to continue the same course until the South side of Summer Bay is open of the South head of Constantine Bay, when a S. ⅜ E. course will lead towards Ulakhta Head, and may be followed until shortly after rounding Priest Rock, when the houses in Iliuliuk may be seen and steered for. In thick weather, beware of running into Constantine or Summer Bays.

In entering Dutch Harbour, round Spithead at a distance of about 150 yards, and anchor in 16 fathoms off the wharf. The best anchorage is nearer the western shore of the bay, and nearly opposite Spithead.

Page 673.—**Kalekhta Bay,** on the eastern side of Cape Kalekhta, has anchorage in not less than 10 fathoms. There is a cascade on its western side (as at Cape Cheerful), and at 3 miles eastward of Cape Kalekhta is *Erskine Point*, off which lies a rock somewhat similar to Priest Rock.

English Bay, southward of Cape Erskine, is deep and clear, and has good anchorage at its head, in about 10 fathoms.

Bay of Otters is now known as *Beaver Inlet*. The best anchorage is said to be in *Food Bay*, on its North side, that off *Biorka* village, on the South side, being in deep water.

Page 674.—**Unalga Island, &c.**—See the Addenda for page 672.

The South coast of Unalaska Island is reported to extend several miles farther South than shown on the chart, and, being fronted by rocks, it should be given a wide berth. About 5 miles within the S.W. end is an isolated conical peak, about 2,000 ft. high, and 23 miles north-eastward of this is *Kulilyak Bay*, a landlocked inlet with depths of 5 to 9 fathoms.

Chernofski Harbour is a deep inlet on the western coast of Unalaska, about 13 miles from the S.W. end. The entrance, between two low promontories, is nearly half a mile wide, and within there is sheltered anchorage for vessels of the largest size, in depths under 20 fathoms. In the northern angle of the bay is a village, with a white church, standing on a shingle isthmus separating this part of the harbour from the sea. No supplies could be obtained here, except wildfowl, salmon, and trout, and water could be had with difficulty from the stream running into the shallow southern angle of the harbour. In case of need, a vessel might be beached here, neap tides rising about 7 feet.

Directions.—In approaching from the northward, make *Cape Neil Juan*, a high, bold promontory. Chernofski church is about 3 miles south-westward from this cape, and is a conspicuous mark; a deep cut in the cliff, about half a mile westward of the church, is also a good mark. Round East Point at a distance of not less than 2½ cables, and steer in E.S.E. in mid-channel, and rounding the low shingle point at the S.E. extremity of the eastern promontory, anchor in 10 to 12 fathoms, mud, in mid-channel, midway between the point and the church.

Makushin or *Makouchinskoy Bay* has a village, with a white church, in the first inlet on the North side, off which there is good anchorage in 14 fathoms. *Makushin Volcano* rises to an elevation of 5,474 ft., at 6 miles to the N.N.W.

Umnak Pass, between Unalaska and Umnak, has not been examined, and rocks have been reported off its southern entrance.

Page 675.—**UMNAK.**—*Cape Sigak* is now considered to be in about lat. 52° 43′ N., long. 168° 57′ W., and to the S.S.W. of it is the low sandy island of *Samalga*, the channel between appearing dangerous. *Vcevidoff Volcano* rises to an elevation of 7,236 ft., and there are no mountains between this and Cape Sigak, the land being hilly as far as Nikolski, and then lower to the cape.

At 6 miles north-westward of Cape Sigak is *Adugagh Island*, about 100 ft. high, and vessels are recommended not to use the channel between, as there are numerous reefs, and the tides run strongly.

About 15 miles N. by E. from Cape Sigak is *Anaiuliak Island*, about 100 ft. high, the channel between it and the coast being foul. At the head of a bay, about 5 miles south-eastward of this island, is the small village of *Nikolski*, with a church, off which there is anchorage.

Pages 675-676.—**BOGOSLOFF ISLANDS.**—A depth of 755 fathoms has been found midway between these islets and the North coast of Umnak, with no trace of the long reef reported.

Bogosloff Island lies about 22 miles N.N.W. from the northern end of Umnak, and was reported to have attained a height of 1,500 ft. in 1832, but in 1903 it was only about 400 ft., and appeared to be wearing away, and showed no signs of volcanic activity.

New Bogosloff, or *Grewingk*, about 1¼ mile N.W. of Bogosloff, rose from the sea, during an eruption in 1882, to an elevation of about 800 ft., but in 1903 it was about 300 ft., and volumes of steam were still given off from fissures in its sides. A low spit extended about a mile from its S.E. side, where landing could be effected in fine weather. In June, 1906, another submarine eruption was reported to have occurred here, an island appearing above the surface; the fishermen who observed it were unable to examine it, owing to the heat of the water.

These islands were connected by a spit of ashes, but in 1895 there was a navigable channel over the site of *Ship Rock*, which disappeared in 1888 or 1889; in 1899, it was again obstructed by a submerged bar. They are frequented by sea-birds and sea-lions, and, when several miles to leeward of them, a smell of sulphur and guano has been noticed. Constant changes in the sea bottom appear to be going on around them.

Page 676.—**Isles of Four Mountains** were examined in 1894 by the officers of the U.S. vessels *Concord* and *Corwin*. They are uninhabited, and, as stated by Lütke, are five in number, extending over an area of 29 miles, N.E. by N. and S.W. by S., the only known danger being a breaking reef reaching 1½ mile south-eastward from the S.E. point of *Chuginadak*, the S.E. and largest island. At the western end of this island is *Mount Cleveland*, a peak rising to an elevation of 8,150 ft., the highest point of the islands. The tidal streams run strongly hereabout. Anchorage was found off the East side of Chuginadak.

Yunaska rises to an elevation of 2,864 ft., and is reported to be charted 4 to 5 miles N.W. of its true position. The *Concord* and *Corwin* anchored off its N.W. extremity, which they observed to be in lat. 52° 37′ N., long. 170° 43′ W. The tidal streams run with great violence in the channel between Yunaska and Amughta. *Tchegula* or *Chugul Island* is 4,300 ft. high.

Amughta rises to a peak, elevated 3,738 feet.

Page 677.—**FOX ISLAND PASSES.**—See the Addenda for page 671.

Page 677.—**ANDREANOFF ISLANDS,** and the islands westward of them, are only approximately shown on the chart. They are now uninhabited, though densely populated when first visited by the Russians.

Seguam, or *Siguam*, is reported to have rocks and discoloured water extending 1½ mile off its East and West ends.

Page 678.—**ATKHA.**—*Korovin Volcano* is now considered to be 4,852 ft. high. *Nazan Bay*, W.N.W. of the West end of Amlia, affords anchorage in 10 fathoms, in its S.W. angle, sheltered by a group of islands and rocks, off the only village in the island of Atkha. Fish is plentiful hereabout.

Page 680.—*Kassatotchy Island* lies about 11 miles N.W. ½ W. from the S.W. extreme of Atkha, and is 1,018 ft. high.

Page 680.—**Adakh.**—*Bay of Islands* entrance is deep and clear, but the harbour is small, with rocky and irregular bottom. The only safe anchorage is that shown on the chart, and that is only large enough for small vessels. The remainder is open to heavy seas sent in by S.W. and N.W. gales.

Page 681.—**Goreloy** or *Burnt Island* rises in a peak, elevated 5,334 feet.

Amatignak Island rises to an elevation of 1,921 ft., and, in 1895, was reported to lie 4 miles South of its charted position.

Page 682.—The strait between Goreloy and Semisopochnoi is reported, by the Aleut fishermen, to have a shoal in mid-channel.

Petrel Bank.—In 1904, the U.S.S. *Petrel* obtained soundings on a bank northward of Semisopochnoi, rising gradually from deep water on its North, East, and West sides. The least depth found was 29 fathoms, about 15 miles N.W. by N. from the eastern extremity of the island, and thence it deepens gradually to the N.W., North, and East, 100 fathoms being found about 28 miles N.N.W. from the same point. It appeared to be about 15 miles across, East and West, on a parallel about 19 miles North of the island. This bank may be found useful as a guide to vessels navigating these waters, as Semisopochnoi is usually hidden by dense fog.

KISKA is only 15 miles in length, N.N.E. and S.S.W., and rises at its northern end to an elevation of 3,700 feet. According to observations by the officers of the U.S.S. *Concord*, in 1901, the N.E. extreme is in lat. 52° 5′ N., long. 177° 37′ E., and a conspicuous rock lies off it. The island appears green, with rocky shores, fronted in many parts by off-lying rocks. Some amount of attention has been devoted to this island, owing to its position near the Great Circle route between western America and Japan, and the U.S. government is about to establish a fortified coaling station at Kiska Harbour.

Page 683.—**Kiska Harbour,** on the eastern side of Kiska, is about 1 mile in diameter, with depths of 15 fathoms and under, sand, good holding ground, secure in any weather. No hidden dangers are known to exist in it, and the tidal currents are very weak, the rise being about 4 feet. Fresh water can be obtained from cascades on the South shore, and fish and wildfowl are plentiful.

Between its southern headland and Little Kiska, *South Pass* is 4½ cables wide, and in 1903, the U.S. surveyors reported that vessels of the largest size can safely use it, being careful to avoid the rocks extending off the western end of Little Kiska. During the survey of 1904, however, some shoal patches were found in mid-channel in the narrowest part, forming a serious obstruction to navigation. The maximum strength of the tidal currents in it is about 2 knots an hour. Kelp grows in depths of 5 fathoms and under.

Little Kiska appears flat-topped from a distance, and has some basaltic columns at its bold northern point. A kelp-marked shoal extends nearly 1 mile E.S.E. from its low East point, and a shoal (with very little kelp) extends about 1 mile westward from the low Tanadak Islet. *Tanadak Pass*, between these shoals, has a rocky and irregular bottom, and should only be used in clear weather, keeping in mid-channel.

Directions.—In approaching Kiska Harbour from the East, vessels are recommended to first sight Semisopochnoi Island, and then steer to pass well northward of Khwostoff and Chugal Islands, and of the reef lying about 5 miles westward of the latter. Then steer to pass about 2 miles eastward of the large rock off the N.E. point of Kiska, and thence south-westward for the harbour, where anchor as convenient. In 1901, the magnetic variation was observed to be 8° E.

Page 683.—**Bouldyr** rises to an elevation of 1,145 feet. Breakers have been reported at about 10 miles E. by N. ½ N., and 12½ miles S. by E. ½ E., from its eastern end, as charted.

Agattou.—In 1894, the U.S.S. *Albatross* found anchorage in *McDonald Bay*, in 15 fathoms, sand, about half a mile off shore, available in westerly winds, about 2 miles south-westward of the N.E. cape, with Cone Peak bearing N.W.

ATTOU rises to an elevation of 3,084 ft., near its centre. A dangerous 15-ft. rock lies in the fairway of the entrance to *Tschitschagoff Bay*, about 1¼ mile from the flagstaff, which appears in line with Range Point. Within this are numerous rocks, and

the depth shoals to a bar of 2 or 2½ fathoms, within which vessels can lie in 6 fathoms and under, off the village at the head of the bay. Good water can be obtained here.

Pages 684, 1181.—**BEHRING SEA.**—(See Addenda for page 704, Prybilov Islands). In the 9th line of the first paragraph, for eastern side read western side.

Winds, &c.—In Behring Sea, fine weather is rare and seldom lasts long, fog and thick weather being the rule during the season of navigation, being almost continuous in summer. After August, heavy gales often occur from almost any quarter, accompanied by snow at and after the end of September. Easterly and southerly winds bring continuous rain, while with westerly or northerly winds rain or snow comes at intervals in squalls. Southerly winds are said to prevail in spring, and northerly winds in the autumn, but observation shows that N.E. winds prevail in April and May, and S.W. and southerly winds in June. In summer, if the air be unusually clear, with a falling barometer, a strong S.E. gale, with rain, almost invariably follows.

The Currents depend much upon the prevailing winds, the set being chiefly to the northward. Near the islands the tidal currents run strongly, the flood setting eastward and northward, and the ebb the reverse. In Bristol Bay, and hence to Yukon River, the tidal currents are very strong, especially in Etolin Strait. At times, a northeasterly current has been observed setting on to the Yukon flats, running at the rate of 2½ knots an hour.

In thick weather, when nearing the coasts, a careful attention to the lead should indicate the approach, and the cries of the sea-birds on the rocky cliffs and islands are also a valuable warning.

Driftwood from the rivers is found along the Alaska coast, and good water can always be obtained near high land. The rivers abound with salmon, and cod is plentiful near the Aleutian Islands and in Bristol Bay.

Ice.—In the open sea, the ice met with in Behring Sea consists of detached fields and floes, at no time forming a solid sheet, except in bays and sheltered parts. In winter, according to reports issued by the U.S. Hydrographic Office, the general contour of the southern ice limit in Behring Sea, in ordinary seasons, is from Bristol Bay to a position at least 60 miles North of Prybilov Islands, then curving south-westward, often reaching lat. 56° N. in about long. 174° W., and then taking an irregular line to the N.W. into the bight westward of Cape Navarin, but a continuance of strong northerly winds may drive fields far southward. Many years ago, ice is said to have descended to Unalaska, and in January, 1878, it reached Unimak Pass and Akutan Island. In some seasons, no ice is seen at the Prybilov Islands, where broken floe ice is usually found from December to May, and in other seasons the ice may extend 35 miles southward of them. Heavy solid ice is not met with far southward of St. Matthew Island.

In April, when S.W. winds set in, the ice begins to move northward, the date varying greatly from year to year, and by June 1 its limit is usually near St. Lawrence Island, the passage westward of which may be open, while that between St. Lawrence and Nunivak may be blocked. In the first week of June, 1900, St. Matthew Island was surrounded by heavy pack-ice. Observation has shown that navigation invariably opens earlier along the western coast, from Cape Behring to Indian Point and thence to East Cape, but should prevailing easterly winds pack the ice heavily off Cape Navarin vessels are advised to seek an opening farther to the eastward, possibly near Nunivak, thence working up to and passing southward of St. Lawrence Island. North-eastward of St. Lawrence Island, the ice is impassable until late summer, closing the approach from the East till the beginning or middle of July. The steam-whalers usually leave Unalaska between April 1-10, when bound northward.

In autumn, ice begins to form along the shores of the northern part of Behring Sea about the middle of October, and by the beginning of December is solid for a distance of 6 to 8 miles off.

In *Bristol Bay*, navigation usually opens between the middle of May and the middle of June. On May 10, 1896, the ice barrier extended from Port Moller to the Prybilov Islands, and vessels could not reach Nushagak River till a month later; while in 1899, a steamer reached Clarks Point (in that river) on April 4.

At *St. Michael*, Norton Sound, ice ceases to form at the beginning of May, but vessels are not expected to reach the settlement till June 10-25; the earliest recorded arrival was May 25, 1875, and the latest July 13, 1890. Navigation is again closed about the middle or latter end of October.

Some further remarks on Ice will be found later on, in the Addenda for pages 698 and 700-701.

Directions.—Steamers bound northward from Unalaska are recommended to steer so as to cross the parallel of 60° N. in long. 168° W., thence keeping along this meridian

till in lat. 63° N. Hence proceed to cross 64° N. in 166° W., and continue on the same course if bound for Nome. If bound to St. Michael, keep along the parallel of 64° till in long. 164° W., whence alter course for that port.

Large vessels rarely approach within 5 miles of Cape Mohican (Nunivak, see Addenda for pp. 689-690), and in foggy weather do not shoal the water under 15 fathoms when in its vicinity. Keep the lead going, also, in case a set should be experienced towards the Yukon flats. A westerly set is often encountered when between St. Lawrence Island and Nome.

Small vessels, and steamers for service on the Yukon, usually enter Behring Sea by *Isanotski Strait* (see Addenda for page 668), and, passing eastward of Amak Island, steer for Cape Newenham, and thence to pass eastward of Nunivak. On clearing Etolin Strait, they keep along the edge of the coast flats, in depths of 3 to 5 fathoms, which will be out of sight of the land when northward of Cape Romanzof. When Stuart and St. Michael Islands are made out, they steer to pass between them. There are several sheltered anchorages, in case of need, as described hereafter and in the Directory.

Page 685.—**UNIMAK.**—Between Cape Sarichef (see the Addenda for page 670) and Cave Point, 16 miles to N.E. by N. ½ N., the low monotonous northern coast of Unimak forms a deep open bight. *Cave Point* is a rocky cliff about 150 ft. high, a great resort of sea-birds, and about 8 miles northward of it is *Cape Lapin*, a low bluff. About 6 miles N.E. of Cape Lapin is *Cape Mordvinof*, eastward of which the coast forms a bight known as *Shaw Bay*; this is shallow, but it affords anchorage in 6 to 9 fathoms, sand, in the S.W. angle, sheltered from all winds but those between N.W. and N.E. Bears, reindeer, foxes, wolves, and wild-fowl are found here. Hence to Isanotski Strait the coast should not be approached in depths less than 12 fathoms, to avoid rocks extending from a half to 1 mile off.

Isanotski Strait (see the Addenda for page 668) is very shallow in its northern part, with strong tidal streams, and is extremely difficult of navigation; the least depth in the channel is about 12 ft., close to the N.E. point of Unimak. It is probably liable to shift. *Point Krenitzin*, its N.E. point, is fronted by breakers.

Cape Glazenap, or *Round Point*, is about 19 miles north-eastward of Point Krenitzin, the coast between being very low; the cape is about 150 ft. high, and is now considered to be in about long. 162° 59′ W.

Izenbek Bay mostly runs dry at low water, but small vessels can find secure anchorage behind Cape Glazenap, the channel close round which has 10 to 12 ft. on the bar. *Khudiakof Islands*, fronting the bay, are very low, and connected by shoals.

Amak Island is about 2½ miles long, and 1,682 ft. high; its South end is now considered to be in long. 163° 7′ 33″ W. Rocks extend from it to *Sivoutchy Rock*, which is about 150 ft. high, and dangers are said to reach 5 miles eastward of its South end. It is stated that small vessels can find sheltered anchorage on its South, S.E., and East sides.

The Coast, between Cape Moffet (or Neumann Point) and Port Moller, a distance of about 70 miles, is very low, and the *Khudubin Islands*, westward of Moller Bay, are the same.

Page 686.—**MOLLER BAY** has had considerable attention drawn to it, owing to the discovery and working, in 1890, of a good 4-ft. seam of bituminous coal about 1¼ mile from the eastern side of Herendeen Bay, its S.W. angle. Tramways and wharves were built by a company, but the seam was lost owing to a "fault," and the works abandoned. The bay was partly surveyed by the officers of the U.S.S. *Albatross*, but the chart must be used with caution, as the extensive banks in the entrance may be liable to shift. This region is uninhabited, but bear and reindeer abound, and salmon was plentiful.

Walrus Island, the easternmost of the Khudubin Islands, is on the western side of the entrance of Moller Bay, and *Wolff Point*, its eastern end, is in about lat. 56° 1′ N., long. 160° 44′ W. *Entrance Point*, on the eastern side of the entrance, appears from a distance of 8 miles to W.N.W. as the southern extreme of a high headland, the first eastward of Cape Glazenap. Bring Entrance Point to bear E.S.E., and steer for it, till within 2 or 3 miles, when steer in between the shoals, in depths of 6 to 12 fathoms, being careful not to get eastward of the shoal extending 3 or 4 miles N.W. by N. from Entrance Point.

In case of fog, vessels can anchor in the entrance, but the tidal streams run strongly. The chart must be the guide hence to Herendeen Bay, and anchorage will be found as convenient. The *Albatross* anchored 1 mile within Point Divide, and at spring tides the flood came in with a "bore" between 2 and 3 ft. high, running 9 knots for a

time. The channel is very narrow here, but higher up it opens out, and the anchorage is more secure. The last quarter of flood tide is the best time for navigating Herendeen Bay, but low tide is the best time to approach it, as the edges of the shoal flats are then visible. There is a least depth of 4 fathoms in the entrance to Herendeen Bay.

It is high water in Mine Harbour, on full and change, at about 8h., the rise being about 15 feet.

From Moller Bay the coast continues low for 19 miles to *Cape Kutuzoff*, which is a rounded bluff about 150 ft. high. *Cape Séniavine*, 11 miles farther on, is a rocky point 75 ft. high, and hence the low monotonous beach trends north-eastward.

Port Haiden (*Comte Heiden Bay*) has not been examined, but there is said to be a good harbour, approached by the channel eastward of Chestakoff Islet.

Cape Menchikoff is now considered to be the southern point of the River Ugashik entrance, in lat. 57° 37′ N., long. 157° 47′ W.

Ugashik River is reported to be navigable several miles by vessels drawing up to 14 ft., but the wide bar has intricate channels, with strong currents; it is said that vessels of 18 ft. draught can cross it, but 10 ft. is about all that can be carried in safely. *Cape Greig* is 243 ft. high, and forms a good landmark; within it is the village of *Ugashik*, with 348 inhabitants at the census in 1900, and a salmon cannery.

Page 687.—**Ugaguk River** has the village of *Igagik* on the South side of its entrance, with 203 inhabitants in 1900. In 1905, Capt. Peterson, ship *Tacoma*, reported that 10 ft. could be carried inside the entrance at low water, and that the cape on the North side of the entrance extends about 3 miles farther westward than shown on the charts. A sandbank, drying at low water, extends along the coast for about 16 miles northward from this cape, and another (the northern half drying at low water) lies south-westward of the river entrance.

Naknek River can be entered by vessels of moderate draught at high water, but at low water will scarcely admit a ship's boat. The *Albatross* anchored in 6 fathoms, about 6 miles S.W. of Cape Souvaroff, whence the depth shoaled rapidly to 3 fathoms towards the head of Bristol Bay. The South head of the entrance is in lat. 58° 42′ N., long. 157° 2′ 45″ W., and about 9 miles to S. ½ E., 5 miles inland, is a solitary elevation named *Johnstons Hill*. It is high water, on full and change, at 1h. 5m., and the rise is 23 feet.

On the South side of the entrance is *Naknek* village, containing 431 inhabitants at the census in 1900, with a salmon cannery. On the opposite side is *Fawik*.

BRISTOL BAY may be said to comprise the area eastward of a line from Unimak to Kuskokwim River. Its shores are usually low, and the interior mountains are generally hidden by fog in summer. It is subject to a great range of tide, which at low water leaves large flats dry on its northern side, reaching in places 5 to 10 miles off shore, with shoals outside them. The coast is fairly well populated by Eskimo tribes, and the head of the bay is the scene of a great salmon-canning industry, second only in importance to that at Kadiak. The season, however, only lasts about 5 weeks, and in September most of the people employed leave with the vessels carrying their produce.

Page 688.—**Kvichak River** entrance has low and swampy shores. On its left bank, about 20 miles above Naknek, is the village of *Kogiung*, which contained 533 inhabitants in 1900. About 7 miles higher up is *Kvichak*, and there are salmon canneries and salteries at both. There is a portage hence to Cook Inlet, by way of Lake Iliamna.

NUSHAGAK RIVER is the headquarters of the salmon-canning industry of Bristol Bay, and the canneries can be reached by vessels of considerable size drawing up to 21 feet. The approaches to them, however, are tortuous, and a pilot must be employed; one is stationed on Protection Point, and a flag is hoisted when he is there. The land being very low, and the river entrance fronted by wide shoals, while the tidal currents may run as much as 6 knots, the lead must be constantly used.

Cape Constantine is very low, and is now considered to be in lat. 58° 26′ N., long. 158° 47′ W. In 1898, the ship *Sterling* was lost on a 15-ft. shoal said to lie about 5 miles S.W. by S. from the cape, and this shoal is said to extend several miles southward and westward. About 12 miles N.W. by N. ½ N. from the cape are *Nichols Hills*, a cluster of rounded elevations 280 ft. high.

Protection Point, 8 miles northward of Cape Constantine, is also very low. Nichols Hills bearing W.N.W. will lead towards it, and, if without a pilot, anchor close off it, allowing for the rise and fall of the tide.

Clarks Point is a bluff 200 ft. high, 18 miles N. by W. from Protection Point, and in lat. 58° 49′ 14″ N., long. 158° 31′ 44″ W. Nearly 3 miles below it is the village of *Ekuk*. The usual anchorage is a half to 1 mile above Clarks Point, and it is high water here, on full and change, at 0h. 53m., the rise being about 24 feet.

There are large salmon canneries and salteries at Clarks Point, *Nushagak* (formerly Fort Alexandroffsk), *Carmel*, and *Kanulik*. There are also a Russian mission station and a large trading station at Nushagak, which contained 324 inhabitants at the census in 1900, when Carmel numbered 381 ; there is a Moravian mission at the latter.

The Coast between the head of Bristol Bay and St. Michael (Norton Sound) is mostly fronted by wide shallow flats, extending many miles off, and in some parts their edge is out of sight of land. Consequently, the lead must be constantly in use in this region, where fog and thick weather are so prevalent in summer, and in large vessels the depth should not be shoaled to less than 10 fathoms. Smaller vessels go closer in, and in fine weather coast along the edge of the Yukon Flats in 5 to 2 fathoms.

The coast increases in elevation westward of Cape Constantine, some of the headlands in *Kululak* and *Togiak Bays* being upwards of 500 ft. high. The off-lying islands and rocks are known as the *Walrus Group*. *Round Island*, the easternmost, is 36 miles W. ½ S. from Cape Constantine, and is nearly 2 miles long, and about 800 ft. high. *Crooked Island* is 4 or 5 miles long, rather low at its eastern end, but nearly 800 ft. high near its N.W. end, off which lies *High Island*, upwards of 900 ft. high. At 4 miles southward of Crooked Island are the *Twins*, two isolated rocks 300 and 100 ft. high. *Black Rock*, about 150 ft. high, lies 1 mile northward of the South end of Crooked Island. The *Albatross* passed between these islands and the coast.

Hagemeister Island is 14 miles long, and mountainous, except at its North end. The *Albatross* passed through the channel between it and the coast, finding 4½ fathoms least water, but the tides run very strongly in it. Good anchorage was found under *Tongue Point*. A shoal of 2½ to 3 fathoms lies 5 or 6 miles south-westward of the island.

Cape Peirce is of moderate height, and off its eastern point lies *Seal Islet*, within which there is good anchorage in 10 fathoms.

Cape Newenham, in lat. 58° 40′ N., is high and rugged, but it is thought that small vessels could find sheltered anchorage on either side of it, according to the wind.

Goodnews Bay entrance is about 26 miles North of Cape Newenham, or in lat. 59° 5′ N., long. 161° 47′ W. It is fronted by extensive shoals, between which there are channels with 4 to 5 fathoms in them, but the bay is almost filled with mud-flats, and only vessels of light draught can enter it.

KUSKOKWIM RIVER is about 800 miles in length, and navigable for vessels of shallow draught for about 500 miles from its mouth. The tide is said to rise 50 ft. in its entrance, which is filled with mud-flats at low water, and here is a great salmon fishery in the summer. There are numerous villages and trading stations on the banks of the river, but sea-going vessels can only reach its entrance by difficult channels between the shifting shoals, and when at anchor are exposed to wind and sea and the rapid tidal currents. Here is a trading post named *Shinyagamiut*, in lat. 59° 40′ N., visited by a steamer annually in June or July.

Pages 689-690.—**NUNIVAK ISLAND** is about 50 miles in extent, but has not yet been surveyed. In 1899, the U.S.S. *Corwin* circumnavigated it at a distance of about 2 miles, finding general depths of 7 to 10 fathoms. It is formed of basaltic rock, covered with grass or moss, and rises on its eastern side to an elevation of about 900 ft., being visible at a distance of 30 miles in clear weather. The coast is generally rocky, occasionally rising in cliffs 100 to 150 ft. high, with numerous small bays, in which the *Corwin* found anchorage in 3½ to 7 fathoms, but they are mostly fronted by islets and breaking reefs. For a distance of about 10 miles off, especially on the eastern and northern sides, the depths are reported to be very uneven, consisting of ridges with deeper water between. Vessels of deep draught always give this island a wide berth. The population numbers about 700, of Esquimaux origin.

Cape Etolin is a low rocky projection, in about lat. 60° 26′ N., long. 166° 8½′ W., and about 2 miles off it is an islet, with rocky ledges between. On its eastern side it forms a bight about half a mile wide, affording anchorage in 6 fathoms and under, gravel bottom, but in depths over 3 fathoms a vessel would be exposed to the strong tidal currents of Etolin Strait. In the N.W. angle of this bight is the village of *Koot*, the principal place in the island.

Cape Mohican, the western extreme of Nunivak, is moderately high, with reddish bluffs. A 4½-fathoms shoal is reported to lie about 14 miles westward of it ; and a shoal of 10 ft., about 3 miles in extent, about 7 or 8 miles north-eastward of it. Another large breaking reef is reported to lie 1½ mile North of it. In August, 1905, the steamer *Senator* was reported to have stranded, during a fog, on a shoal with less than 3 fathoms over it, distant about 5 miles N. by W. from Cape Mohican. (See the Addenda for page 684).

Depths of 4½ to 9 fathoms are said to extend 12 to 15 miles off the western coast of

Nunivak. On the S.W. side is an open bay, with 6 fathoms, sand, at three-quarters of a mile off shore, where vessels can anchor; a stream runs into it from a lagoon.

Cape Mendenhall, the southern extreme of Nunivak, is about 200 ft. high, and breakers have been seen 6 or 7 miles off it. In 1899, Capt. Smith, of the *Balena*, reported a 2¾-fathoms shoal about 12 miles South of the principal peak of Nunivak, and was of the opinion that this shoal extends to the north-westward along the coast of the island.

From Cape Mendenhall steep bluffs extend about half-way to *Cape Corwen*, the low eastern point of Nunivak. Small vessels can anchor at the head of the bight lying between them.

About 12 miles southward of Cape Etolin is a cove, where small vessels can find shelter, said to be the best anchorage on the East side of Nunivak; water can be obtained here.

Etolin Strait, between Nunivak and the mainland, has not been surveyed, and there are said to be several reefs in it; the tidal streams run strongly through it. There are said to be general depths of 5 to 8 fathoms in it.

Page 690.—**The Coast**, northward of the Kuskokwim, is mostly very low and swampy, and fronted by wide mud-flats.

Cape Vancouver is a bold promontory, with deep water close off it, and the land here rises to an elevation of about 1,800 feet. On the South side, about 5 miles from its extremity, is the village of *Tununak*, with a trading store.

CAPE ROMANZOFF is now considered to be in about lat. 61° 48′ N., long. 166° 15′ W. Its western face consists of abrupt cliffs over 1,200 ft. high, and about 5 miles inland the *Askinuk Mountains* attain an elevation of 2,363 feet.

Scammon Bay, the shallow bight north-eastward of Cape Romanzoff, has a hilly and cliffy coast, but is fronted by low sand islands and numerous bars bare at low tide. About 2½ miles northward of the cape is a 5-fathoms channel leading to a limited area fit for anchorage within the southern sand island, whence a narrow channel of about 2 fathoms leads on through the bay to *Khun River*, which is about 15 miles from Cape Romanzoff. This bay was examined by U.S. surveyors in 1899, and found to be useless as a port for the Yukon trade.

Pages 690-691.—**YUKON FLATS.**—Recent surveys show that the low coast of the Yukon delta extends 15 miles farther westward than previously supposed, but the position of the flats was approximately correctly shown on the chart. From a position 5 miles West of Cape Romanzoff the 5-fathoms line extends about 100 miles North to a position in lat. 63° 25′ N., long. 165° 5′ W., where it turns eastward, and runs 65 miles about E.N.E. to the West end of Stuart Island. On the western edge the 3-fathoms line is seldom more than a mile inside the 5-fathoms line, but on the northern edge this distance gradually increases. (See the Addenda for page 688).

Page 691.—On August 27, 1897, Captain J. F. Higgins reported that his steamer *Excelsior* grounded on a shoal of hard sand, with 10 ft. at low water, about 40 miles westward of Stuart Island, or in lat. 63° 42′ N., long. 164° 10′ W. It continued shallow for 3 miles to the N.W., but deepened quickly to the eastward and N.E. He considered it to have been recently formed, probably by the action of ice.

In 1899, the U.S.S. *Patterson* could not find this reported shoal, nor the two other patches said to lie northward of the flats. In June, 1900, however, Capt. White, of the brig *Mermaid*, found an extensive shoal, in about lat. 63° 31′ N., long. 164° 58′ 30″ W., with 16 ft. at low water over an area about 4 miles in diameter. For 8 miles eastward and southward of this not less than 25 ft. was found, and from the northern edge the water deepened gradually to a depth of 7 fathoms. Ice prevented an examination of the western edge.

Capt. Higgins gives his opinion that it is not safe to pass into or out of Norton Sound, South of the parallel of 64° N. To East of long. 164° W., in the sound, there is no greater known depth than 15 fathoms, and between Golovnine Bay and Stuart Island there are spots with only 7 fathoms on them. He also states that North of the Yukon, on the line of the immense body of ice which passes out of the river, the bottom changes from year to year, and is very lumpy, he having found, in June, 1897, while dodging along the ice, spots with 17 ft. on them, alternating with depths of 6 fathoms. He has seen large ice-floes aground in 8 and 9 fathoms, and, with the water full of sand during the spring and summer freshets, a shoal can be quickly formed about one of the floes. Between the mouth of the Yukon and Cape Nome, the soundings may be expected to vary considerably from year to year.

Directions.—See Addenda for page 684.

Pages 691-692.—**YUKON RIVER,** as already stated in the Addenda for page 454, forms the easiest but longest means of approach, for cargo, to the goldfields around the upper part of its course. Considerable attention has been given to this river by the Canadian and United States surveyors, so that this region is now fairly well known. Taking either the Pelly River or Lewis River as its source, its length is estimated to be from 2,500 to 2,800 miles, of which 2,300 miles are navigable by river steamers. At the junction of the Pelly and Lewis Rivers, about 1,850 miles from the mouth, the river is about three-quarters of a mile in width, and this can be reached by 400-ton stern-wheel vessels, drawing 4 ft., and smaller vessels can ascend 300 miles beyond this, to Lake Teslin (see the Addenda for page 602). At Fort Yukon, near the Arctic Circle, the river is about 8 miles in width. *Dawson City*, at the mouth of the famous *Klondyke River*, about 1,570 miles up the Yukon, is reached by the steamers from St. Michael in 14 to 16 days, and contained 9,142 inhabitants at the census in 1901.

The river steamers were formerly dependent on wood for fuel, but deposits of coal have been found up the river, and are now being worked.

The river delta has a sea-face of about 100 miles, and there is no known suitable location for a town at its entrance, owing to the land being all overflowed annually on the breaking up of the ice. Neither is there any safe anchorage off it, owing to the wide extent of shallow and uneven ground. Ocean-going vessels, consequently, transfer their passengers and cargo at St. Michael into the river steamers.

The head of the delta is about 100 miles from the sea, and for some 200 or 300 miles above this the river is many miles in width, appearing like a sea of yellow water. The river does not become open for navigation before July 1, as a rule, and becomes frozen up again by October 1.

The low land of the delta is only visible 3 or 4 miles seaward, but in clear weather, which seldom occurs in summer, the high lands of Cape Romanzoff are visible far off, as also are the sharp peaks of *Mount Kusilvak*, 2,449 ft. high, in about lat. 62° N. It is subject to mirage, especially when the wide flats are bare. There are many Eskimo settlements along it. In summer the prevailing winds are N.E., easterly, and S.E.

Kwiklowak or *Kusilvak Mouth*, in lat. 62° 35′ N., is the largest branch of the Yukon delta, but only about 6 ft., at mean low tide, can be carried over the bar of *Acharon Channel*, about 16 miles S.W. from its entrance. Within, a least depth of 20 feet was found, during the survey of 1899, as far as the head of the delta.

Kawanak or *Kwikpak Mouth*, in about lat. 63° N., long. 164° 10′ W., had 9 ft. over its bar at low water, in 1899, but the channel from sea is too narrow and tortuous for navigation.

Apoon Mouth, about 40 miles from St. Michael, is the most northern outlet of the Yukon, and that almost exclusively used by the river steamers, with the aid of pilots. It is, however, narrow and intricate, whereas the other mouths are wider but shallower, and blocked by bars and driftwood. About 5 miles eastward of it is the *Hog Back*, a rounded ridge about 300 ft. high, and farther inland is a range of mountains.

Apoon Mouth runs south-westward, and joins the Kwikpak Pass, and has a least depth of 5 ft. at low tide, but its entrance is fronted by wide flats with but 2 to 4 ft. over them at low water, so that the light-draught river steamers have to wait for high water to cross them. The highest rise of the tide is about 4½ ft., and the rise is greatly affected by the winds.

NORTON SOUND, the N.E. angle of Behring Sea, appears to be clear of detached shoals, and the depths decrease gradually towards its shores, but the Yukon Flats are very steep-to; consequently, large vessels keep over towards the northern side in entering or leaving. It is also less subject to fog, which is rare at St. Michael. The appearance of the land near this place is often distorted by mirage.

Ice.—As a rule, it is not safe to enter Norton Sound much before July, on account of the ice, which forms again early in October. In 1899, drift-ice was met with off the northern shore so late as July 11. The position of the ice depends greatly upon the prevailing wind and the current from the Yukon, and the ice is sufficiently heavy to require caution on the part of vessels not fitted to encounter it. (See also the Addenda for page 684).

Tides. In Norton Sound the usual range of tide is about 3 ft., but it is much affected by the winds; a strong southerly gale may cause a rise of 8 to 10 ft., while a strong northerly gale may cause a fall of the same amount.

Page 692.—**Cape Romanoff** is 340 ft. high, and appears like an island from a distance, the land on either side being low.

Stuart Island, in about lat. 63° 31′ N., is about 10 miles in extent E.N.E. and W.S.W., rising near its centre to a flat-topped hill 480 ft. high. Rocks extend 1½ cable off its

western end, and reefs and shoals reach about 2 miles off its eastern side, which consists of bluffs about 170 ft. high.

Stephens Pass, between Stuart and St. Michael Islands, is two-thirds of a mile wide, and is used by the Yukon River steamers.

St. Michael Island, of larger area than Stuart Island, is also low, but rises near its centre in a hill 472 ft. high, and has a sharp conical hill at its N.W. end. A reef extends about 2 miles off *Rock Point*, its northern extreme. *Whale Islet*, 100 ft. high, lies close off the East end of the island, and about 2½ cables N.W. of Whale Islet is *Beulah Islet*, 50 ft. high.

St. Michael Canal, between St. Michael Island and the coast, is very narrow and tortuous, and can only be used by the smaller class of river steamers.

Egg Islet, about 10 miles N.E. of St. Michael, is a flat rocky islet about half a mile in diameter, and probably not over 50 ft. high, sloping from a moderate bluff to a low point at the eastern extremity. It is clear of danger, with anchorage all round it, affording good shelter with northerly winds, when too rough for vessels to lie off St. Michael.

Pages 692-693.—**ST. MICHAEL**, on the East side of St. Michael Island, contained 857 inhabitants at the census in 1900, and large warehouses have been erected here, and on the mainland adjacent. Wharves have also been constructed for the river steamers, but large vessels discharge cargo by lighters. Supplies of various kinds, including coal, can be obtained from the stores, but fresh water is very scarce. Small repairs can be executed for hull and machinery. There is telegraphic communication with the Upper Yukon, &c.

From October to April, inclusive, the average temperature at St. Michael is below freezing point, and the thermometer has registered as low as 55° F. below zero. July, the warmest month, has a mean of about 54°. From records extending over 22 years, the earliest date at which the ice would allow sea-going vessels to reach St. Michael varied from June 13 in 1898 to July 13 in 1890. The sea began to freeze on October 6 in 1894, and on November 10 in 1889.

In summer the climate is very depressing, cloudy weather with misty rain prevailing, and snow often falls, while in winter it is mostly clear but intensely cold. Strong gales occur throughout the year, but are most frequent in autumn.

St. Michael has now become a very busy place during the open season, from June to October, but there is no harbour in the proper sense of the word, the anchorage being unsafe in bad northerly weather, both from want of protection and the shoal water. The depth at the usual places of anchorage ranges from 3 to 4½ fathoms, the latter depth being at a distance of 2 miles from the landing. When a sea arises, vessels find it often necessary to shift anchorage farther out, or leave altogether.

Directions.—In approaching Norton Sound and St. Michael from the South, a good berth should be given to the mud-flats and shoals making out from the delta of the Yukon. Vessels should keep outside the depth of 8 or 10 fathoms, as it shoals rapidly, and there are lumps reported as forming. The best course is to steer for Cape Nome, from a position between Cape Smith and the S.E. cape of St. Lawrence Island. When within 10 miles of Cape Nome, stand to the eastward along the northern shore, until Cape Darby is sighted, and then steer for Egg Island, off St. Michael. The best guides for St. Michael are Egg Island and two low rounded hills, known as the *Sisters*. The general course from Egg Island to St. Michael anchorage is *S.* 36° *W.* (true), and the bearing of the Sisters from Egg Island is *S.* 8° *W.* The soundings from Egg Island to the usual anchorage run very evenly; 7 fathoms is found off the island, decreasing to 6 and then 5 fathoms, until the anchorage is reached, 8 miles distant from Egg Island, with a depth of 4¾ to 4 fathoms, mud.

At night, when the lights of St. Michael show over the land westward of Whale Islet, strangers must be careful not to enter the bight between it and Rock Point by mistake.

Pages 692, 693.—**The Coast** near St. Michael is low, but inland are low bare volcanic mountains. At *Tolstoi Point* it is high and rocky.

Page 694.—*Besborough Island* is about 600 ft. high, and *Cape Denbigh*, about 15 miles distant, is a moderately high rounded hill.

Cape Darby is now considered to be in lat. 64° 18′ N., and is a high rounded mountain, with steep reddish rocky bluffs.

Golofnin Bay extends about 12 miles northward to the entrance of *Golofnin Sound*, which is shallow. To the eastward of Rocky Point is an extensive middle ground, with 3¾ fathoms least water, but there is deep water along the eastern shore. On the sandspit at the entrance of Golofnin Sound is the village of *Checnik*, and vessels can anchor about half a mile off it. River steamers run hence through Golofnin Sound to *Fish River*, with supplies for the gold-mining camps in the interior. Silver lead ore has been found about 40 miles up the river.

Vessels drawing up to 16 ft. can reach the sheltered anchorage in 6 to 7 fathoms, between the two spits at the entrance to Golofnin Sound. The steamer *Bertha* anchored in 4 fathoms, close westward of *Carolyn Islet*, on the East side of the bay, 8 miles within Cape Darby.

For about 25 miles westward of Golofnin Bay the coast is high and bold, but beyond this to Cape Nome it is low with high land within, Several gold-mining camps have been formed on the beach, and about 12 miles eastward of Cape Nome is *Port Safety*, the western entrance of a large lagoon, affording excellent shelter for vessels drawing up to 8 feet. Two white pyramidal *beacons*, 2½ miles apart, were erected here in 1899, and in line bearing W.N.W. lead over the outer bar. It is connected with St. Michael by a telegraph cable.

CAPE NOME, a bluff about 300 ft. high, is in about lat. 64° 23′ N., long. 165° 5′ W., its name being derived from the mistake of draughtsmen, ? *name*, on the manuscript survey by the *Herald* and *Plover*, 1845-1851, appearing as Cape Nome in the engraved chart. Hence to Point Rodney the coast is mostly low and sandy, but abreast Sledge Island the hills slope down to the beach; the water shoals gradually towards it, but under 5 fathoms the bottom is irregular. In 1899, Capt. Weaver, of the steamer *Roanoke*, drawing 18½ ft., touched on a shoal spot about 1⅜ mile off shore, about 8 miles north-westward of Cape Nome promontory; not less than 18½ ft. was found over it at about half-tide.

Several small rivers run into the sea, and light-draught river steamers can cross the shifting bars of the Nome, Snake, and Sinrock. In 1898, the discovery of alluvial gold was announced on the coast at Sinrock, about 30 miles N.W. of Cape Nome, which resulted in a "rush" in 1899 and 1900, when gold was found in large quantities along the beach, and many mining camps were formed along the coast between Port Safety and Port Clarence. In the year 1900, the estimated value of the gold thus obtained from *Seward Peninsula*, situated between Norton and Kotzebue Sounds, was about £1,000,000.

NOME CITY, the principal settlement on this coast, is at the mouth of Snake River, about 11 miles north-westward of Cape Nome. At the census in 1900 the inhabitants numbered 12,488, but in 1903 this number had fallen to about 3,500; from November to June, it is quite isolated by ice, but it is connected with St. Michael by telegraph cable. There are no harbour facilities here, cargo and passengers having to be landed through the surf in lighters; many lives have thus been lost, and much destruction caused to shipping and cargo.

Large vessels lie in 7 fathoms, sand, about a mile off the beach; smaller vessels anchor closer in, but not in less than 5 fathoms. With strong southerly winds this anchorage is unsafe, and vessels must then put to sea, or seek shelter under Sledge Island. Nome is difficult to distinguish from a distance; in summer the shipping lying off it will first be seen.

Sledge Island, or *Aziak*, lies about 25 miles westward of Cape Nome, and 4 or 5 miles off shore, with a depth of 6½ fathoms in mid-channel. Vessels can anchor all round it, as may be convenient. It is rocky and flat-topped. In 1905, a line of heavy breakers was reported to extend about 1 mile north-eastward from it.

King Island is about 1 mile in extent and 600 ft. high. The village is on the South side, and vessels may anchor in about 15 fathoms, mud, close off it, sheltered from N.W. winds. King Island is distinguishable from Sledge Island, by being somewhat lower in the centre.

In 1905, a 7-ft. patch was reported to lie 1 mile southward of *Rodney Point*.

From Point Rodney to Cape Douglas the shore is low and sandy, and should not be closely approached. A shoal, with 10 ft. least water over it, is reported to lie nearly 5 miles off shore, about halfway between Cape Douglass and Point Spencer, with a ridge of 4 to 5 fathoms extending W.N.W. from it to about the parallel of Point Spencer.

Page 696.—**PORT CLARENCE** is now frequented by the Arctic whaling vessels, who here await the annual visit of the relief steamer from San Francisco, about the beginning of July. The discovery of gold in this region has also brought it into prominence, and several settlements have been formed on its shores. It is subject to dense fogs in summer. Vessels can always find sheltered anchorage here, whatever the direction of the wind. The *Thetis* found the best anchorage in 4¾ fathoms, just inside Point Spencer, and under the lee, in case of southerly winds, of a shoal spit from the main spit of the point; the holding ground is good, mud and fine sand, and there is good protection from northerly winds, but poor from southerly and westerly gales. There is some little range of tide, which varies with the wind, as in Norton Sound; the rise is increased by S.W. winds, and decreased by N.E. winds. Fresh water can be obtained from streams.

Between Point Spencer and the shoal bank fronting the northern coast, the entrance of Port Clarence is 3½ miles wide, with depths of 7 to 9 fathoms, and clear of detached shoals, like the harbour within, over which the depth varies from 5 to 7 fathoms. There is a government reindeer establishment in the northern angle of the port.

On the East side of the harbour, about E. ¼ S. from the extremity of Point Spencer, is the village of *Bering*, which had about 200 inhabitants in 1900. There is anchorage off it, with shelter from easterly and N.E. winds. About 5 miles northward of this is the village of *Teller*, on the South side of the entrance to Grantley Harbour, and there were about 1,000 inhabitants in 1900.

GRANTLEY HARBOUR is about 12 miles in extent, and from 3 to 4 miles in width, with general depths of 3 to 3½ fathoms and under, but the entrance will not admit vessels drawing over 12 feet. Vessels can be hove down on the northern sandspit. Light-draught river steamers run up the river at its head, connecting Teller with the goldfields in the interior.

Directions.—In thick weather, the spit of Point Spencer is not easily distinguishable. In coming from the South, the safest course is to steer for Cape York, and then keep along shore to the eastward to the entrance of the harbour, giving the coast a berth of at least 2 miles. It must also be remembered that, outside the port, the current generally sets north-westward, 1 to 2 knots an hour.

Page 697.—**Cape York** terminates in high rocky cliffs, and is backed by rugged mountains. A 6-ft. sunken rock is reported to lie about three-quarters of a mile off it, on which the steamer *Sadie* struck in 1904, with York village bearing N.W. At the head of the bight between this and Cape Prince of Wales is a low beach, backed by low undulating hills. At 15 miles eastward of the latter cape is the mining settlement named *York*; tin has been found hereabout.

CAPE PRINCE of WALES has a low sandy beach on its N.W. side, and here is the native village of *Kingegan*, which had 396 inhabitants at the census in 1900, with a mission station. They visit the Siberian coast in their skin boats, and bring back large quantities of reindeer skins. The soundings decrease rapidly from 13 fathoms, off the village, and vessels should not anchor in less than 7 fathoms; here the current sets northward, from 2 to 3 knots an hour.

A ridge of sand extends about 30 miles N.N.W. from the western extremity of Cape Prince of Wales, its western side being very steep-to. It must be given a wide berth, several vessels having struck on it when distant 10 to 15 miles from the cape. In coming from the North, beware of getting embayed eastward of it.

1907.

Page 698.—**BEHRING STRAIT** is closed by ice from about the middle of October to the middle of June, and is usually quite free from it by the beginning of July. In winter, the natives of either coast cross it to the Diomede Islands, with a good deal of risk. It is not safe for vessels to be northward of the strait after October 10. More ice is usually found on the East side than the West side.

Driftwood is often carried through it northward in large quantities, so that vessels can easily replenish their store, if necessary. The current usually sets northward here, about 2 knots an hour, but southerly winds may increase its velocity to 3 or 4 knots; continuous northerly winds may, however, cause a southerly set, and vessels have then been set far southward of their supposed position.

Captain Healy, of the U.S.S. *Corwin*, states that dense fogs often embarrass the navigation in this region, and that at these times the seabird rookeries on King Island, the Diomedes, Cape Seppings, Cape Thompson, and Cape Lisburne form valuable guides for ascertaining a vessel's position, the cries of the birds admirably answering the purpose of a fog signal.

DIOMEDE ISLANDS are steep-to, with no beaches, so that landing is difficult. The larger island is about 1,700 ft. high, and the other somewhat lower, and they are about 2 miles apart, with a clear channel between. There is a village on the S.W. side of the larger one, close off which there is anchorage in 14 fathoms, sand. There is also a village on the western side of the smaller island.

The Boundary between Alaska and Russia passes southward from between these islands to the parallel of 65½° N., thence south-westward to the meridian of 172° W., passing midway between St. Lawrence Island and the Siberian coast, and thence midway between Attu Island and Komandorsky Islands, to the meridian of 167° E.

Page 699.—**Schischmareff Inlet** is about 60 miles north-eastward of Cape Prince of Wales, and hence to Cape Espenberg the coast is a line of low bluffs and sandhills. There are many small native villages along all this coast.

Cape Espenberg, about 55 miles from Schischmareff Inlet, is a very low sandspit, difficult to make out.

KOTZEBUE SOUND, and the rivers running into it, have been prospected for gold, but with poor results. There is a mission station at *Kiktarak*, North of Cape Blossom, and on the mainland near Chamisso Island is a small trading post. In early summer, the swampy parts are infested with mosquitos, which die off in August. It is usually open to navigation from the middle of July to the early part of October, when it again freezes over; ordinary vessels should leave by about the middle of September.

Good Hope Bay, the south-western angle of Kotzebue Sound, has a low swampy coast. Southward of Chamisso Island is the mouth of the *River Keewalik*, into which Capt. J. Campbell, of the schooner *Seven Sisters*, 1904, states there is a good channel, with 12 ft. at high water, leading to an anchorage behind the spit at the entrance; this is known as *Candle Creek*, and there is a pilot here. Ordinary tides rise 4 to 4½ feet.

Puffin Islet is connected with the western end of *Chamisso Island* by a shallow rocky bank. There is good anchorage around this island, according to the wind.

Eschscholtz Bay is about 20 miles in extent, but is very shallow. *Choris Peninsula*, forming its western side, has two hills on it, about 300 ft. high, with low land northward of it. Hence to *Cape Blossom* the coast rises in low bluffs of ice and frozen mud, the cape being the highest part of them. There is anchorage in 5 fathoms with the cape bearing between E.N.E. and E. by N., distant 3 miles, protected from easterly and northerly winds.

Hotham Inlet is obstructed by vast mud-flats and sandy ridges, and its entrance will only admit draughts of 4 to 5 feet. Several streams and rivers run into it, the principal being the *Kowak*, which has been ascended by stern-wheel steamers for a distance of 200 miles, and coal has been found on its banks. Between Hotham Inlet and Cape Krusenstern the coast is a low beach.

Cape Krusenstern is a low point, with a shoal extending about 2 miles north-westward of it. About 3 miles inland, the land rises in a series of cliffs to high mountains farther in, and these extend about 30 miles north-westward, terminating in the *Mulgrave Hills*. Hence to *Cape Seppings* the low marshy coast continues, backed by a wide plain, but at the latter cape the mountains again approach the shore.

Cape Thompson terminates in a long range of abrupt cliffs, about 500 ft. high. The watering place is a ravine near its central part, off which there is anchorage in 5 fathoms, sand, and landing is easy. Elsewhere the bottom is generally rocky. In the bight between this and Point Hope are a number of permanent whaling stations, occupied throughout the year.

Point Hope is the extremity of a low marshy tongue of land extending about 16 miles westward from the mountain range, and terminates in a steep shingle beach with a large village and a mission station on it, the inhabitants numbering 623 at the census in 1900. At 2½ miles N.W. of it is a depth of 4 fathoms on the southern end of a detached shoal, which thence extends 3 miles W.N.W., with 5 to 6 fathoms over it.

About 15 miles north-eastward of Point Hope is the entrance of *Marryat Inlet*, admitting vessels drawing up to 10 ft., and small vessels winter here, off a whaling station. Hence to Cape Lisburne the coast consists of rugged cliffs, at the foot of the mountains, and there are several ravines where water can be obtained from streams. There are said to be warm springs below these cliffs, which prevent the sea freezing over in winter.

CAPE LISBURNE has some pinnacles and scattered rocks near its summit, and severe squalls descend from it with off-shore winds. A rocky ridge extends 5 miles north-eastward from it, 5 fathoms being found at 2 to 3 miles distant.

Seams of coal exist in the bluffs between Cape Thompson and Cape Beaufort, but it is of poor quality, and in most places difficult to obtain. Much has recently been worked and shipped to Nome. It is only safe to anchor off this coast, with off-shore winds. There are many streams of good water along it, but northward of Cape Beaufort it is almost impossible to obtain it.

Page 700.—About 8 miles northward of Cape Beaufort is the southern end of a shallow lagoon, which thence extends along the coast for a distance of 30 miles beyond Icy Cape, being separated from the sea by a narrow and low sandy beach, with several shallow openings through it. There are several small native villages along it.

Icy Cape has a village on it, and in 1889, a mast *beacon* was erected by the crew of the U.S.S. *Thetis*, about 3¾ miles S.W. of the cape; in 1902, this was replaced by a white

beacon 20 ft. high, with cross-arms at the top. It was found in 1889 that the S.W. side of *Blossom Shoals* extended about 2 miles farther off shore, and 2½ miles farther to the S.W., than then shown on the chart; the beacon bearing *S.* 36° *E.* (true) led clear of the S.W. side. They appear to be extending, and whalers give them a wide berth, not approaching within the depth of 12 fathoms. At 10 to 12 miles north-eastward of Icy Cape is an opening into the lagoon, admitting vessels drawing up to 8 ft., and 2 to 3 fathoms within.

Wainwright Inlet is fronted by a shoal extending about 2 miles off. *Koog River* runs into it, and good coal has been found on its banks.

Seahorse Islands are constantly changing, and *Point Franklin* is difficult to make out, being a small islet distant from the other islands. They enclose a large lagoon. Shoals extend several miles northward and north-eastward of Point Franklin, and vessels rounding it should give it a berth of 4 or 5 miles. There is now no meteorological station at *Ooglaamie* (near Cape Smyth).

Peard Bay, eastward of Point Franklin, has regular soundings, and whalers often anchor here during southerly and S.W. gales.

Cape Smyth is indistinct, but there is a large village on it, containing 314 inhabitants in 1900, with a whaling station, off which there is good anchorage. From 1881-1883, there was a U.S. meteorological station here; at a depth of 39 ft., the temperature of the earth was found to be 12° F., the lowest air temperature recorded being 51½° below zero, and the highest 65½° above. Hence to Elson Bay the coast is low, and backed by a grassy plain. Between Refuge Inlet and Elson Bay, a depth of 7 fathoms is found about 1 mile off shore, quickly decreasing to a ridge of 2½ or 3 fathoms, within which the water again deepens to 3 and 4 fathoms, and vessels here find shelter from ice. This ridge appears to cease about 1½ mile off the southern end of the sandspit forming Point Barrow.

POINT BARROW, on the extremity of which is the village of *Noo-wook*, is now considered to be in about lat. 71° 22′ N., long. 156° 12½′ W. Here the sandspit turns abruptly eastward, and forms the southern side of *Moore Channel*, leading into the shallow area known as *Elson Bay*. This channel has 3 fathoms least water, between the spits on either side, and affords anchorage in 3½ to 4 fathoms, protected from heavy ice. There is very little tide here, but S.W. winds may raise the level 3½ feet.

There is a government relief station at Point Barrow, also a mission station.

In 1890, Capt. Smith, of the whaler *Balena*, reported that *Ow-n Shoal*, of 3½ fathoms, shown on the charts at about 10 (or 6) miles N. ½ E. from this point, does not exist.

In some seasons the pack-ice has remained on Point Barrow the whole year, and it is seldom prudent for sailing vessels to venture eastward of it. The whalers approach it with the greatest caution, and many have been wrecked in its vicinity. Vessels remaining eastward of this point, after the first week in September, must be prepared for wintering.

The NORTH COAST of Alaska is but little known, and the chart can only be considered as a sketch. Even in summer, the pack-ice seldom recedes far from it, and often closes down upon the projecting points, so that vessels venturing along it must be prepared to winter here. Steam-whalers seldom get farther than Return Reef. Eastward of Herschel Island, the outflow of Mackenzie River keeps the bay, into which it runs, clear of ice in summer.

As far as the boundary between U.S. and British territory, in long. 141° W., the coast is a low marshy plain, with several deep bights, into which run streams and rivers, and fronted by numerous low islands and shoals. Eastward of long. 148° W., the mountains approach the coast. There are Eskimo settlements in various parts, which depend on the abundant driftwood for fuel. There is a whaling station on *Herschel Island*, where many steam-whalers now winter.

When off this coast, a look-out must be kept for what the whalers call "*witch currents*," shifting swirls which may render a vessel unmanageable among the ice.

Pages 700-701.—**ICY or POLAR SEA.**—Navigation northward of Behring Strait is only possible during August, September, and the early part of October, when the edge of the pack-ice generally extends from Icy Cape westward to Herald Island, though stretches of open water often reach 20 or 25 miles northward of that island. Thence the ice extends south-westward towards Cape North. Wrangell Island appears to be always firmly enveloped by the pack. October 15th is considered as the limit after which it is not safe for vessels to be northward of Behring Strait, unless prepared to winter.*

* "Ice and Ice Movements in Bering Sea," by James Page, 1900, published by the U.S. Hydrographic Office.

In 1880, some whalers managed to pass northward through Behring Strait as early as May 22, but the usual time of opening is between June 15 and 25. The relief steamer usually reaches the whaling rendezvous at Point Hope between July 5 and 10.

Northward of Icy Cape, there is always a risk of the pack-ice setting on-shore with westerly winds.

It is unnecessary here to enlarge upon this subject, as no two seasons are alike. Those interested are recommended to refer to the pamphlet mentioned in the note on the previous page, or to a "Report of Ice and Ice Movements in Bering Sea and the Arctic Basin," by Ensign E. Simpson, U.S.N., 1890.

Currents.—From Behring Strait to Point Barrow, there is a general northerly current alongshore, running 1 to 2 knots an hour, or even faster as Point Barrow is approached, but it is much affected by prevailing winds. In the open sea the currents are variable, but there is a general set northward.

Weather.—In this region there is usually much rain and fog during the open season, with variable winds, though mostly easterly and southerly. Gales seldom occur in summer, but become frequent on the approach of autumn.

Page 701.—**Bank.**—In 1889, Capt. McGregor, of the whaler *Narwhal*, reported a 12-fathoms bank, in lat. 71° 54′ N., long. 161° 10′ W., and considered there was shoaler water farther westward.

Herald Island was ascended by officers of the U.S.S. *Corwin*, in 1881, when its height was determined at 1,200 feet. In 1889, Capt. Whiteside, of the whaler *Lucretia*, reported that his vessel was lost on a reef extending from the western end, at a point 6 miles S.W. by W. from the northern extreme, and the reef appeared to extend much farther westward.

Page 702.—**ST. LAWRENCE ISLAND** consists of granitic rocks, with a few patches of moorland and grass. The natives, numbering about 270, subsist by the chase of bear, fox, reindeer, seal, &c. A government reindeer station has been established here. It is thought that anchorage may be found all round the island, but the shores must be approached with caution, as they are fronted by rocks and foul ground in places.

The eastern shore is mostly a low sandy beach, with off-lying rocks, but rising inland to mountain ridges visible 30 to 35 miles off. *South-East Cape* is fronted by reefs, which extend 2 or 3 miles southward from it; *Cape Krallegak*, its N.E. point, is a long sandspit, strewn with rocks. Vessels have anchored at the head of the bight between this and East Cape, where there is a very low valley between the mountains on either side.

Punuk Islets lie about 5 miles E.S.E. of East Cape, and vessels should not attempt to pass between. The northernmost and largest has two rocky hummocks, 100 to 150 feet high, and the southernmost is a rocky mass about 75 ft. high; between them is a low sandy islet. They should be given a wide berth, as their shores are all foul, and a ledge extends several miles southward of the southernmost.

North-East Cape is from 800 to 1,000 ft. high, terminating in a low sandspit. For 10 miles westward of it, the North shore of St. Lawrence Island is a low grassy plain, about 2 miles off which there is anchorage in 8 to 9 fathoms, gravel.

Cape Chibukak, the N.W. point, is a flat-topped bluff about 600 ft. high, and the Eskimo village of *Seevookuk* or *Gambell*, with about 300 inhabitants, is situated on the wide sandy beach, about half a mile off which there is anchorage in about 7 fathoms, hard bottom. There is a government mission station here, where mariners in distress may obtain succour. There is also a small village at *South-West Cape*, above which the land is mountainous. Eastward of this the land becomes low.

In 1901, the steamer *Balæna* was wrecked on a reef extending about 3 miles off *Cape Chitnak*, towards which, in approaching from the South, the water shoals quickly from 9 fathoms to 10 feet. Its outer part only dries at extreme low water, after strong North or N.E. winds.

Pages 703-704.—**ST MATTHEW ISLAND** is uninhabited. It appears to be almost constantly enveloped in fog, and has a cheerless and inhospitable aspect, the climate being cold and damp. Heavy ice is met with in its vicinity, drifting on to it with the prevailing winds. When visited by the U.S.S. *Thetis*, in June, 1889, no bears were seen, only a few foxes, with snipe and duck. Fresh water is abundant.

There is anchorage around St. Matthew Island, according to the wind, but the chart is a mere sketch, and the coast must be approached with great caution, as there are numerous detached rocks. The range of tide is about 4 ft., and the streams run from 1 to 2½ knots an hour, flood to the eastward, and ebb to the westward.

Cape Upright has a solitary rock, about 25 ft. high, off its extremity. The *Thetis* anchored in 12½ fathoms, sand, in the bight westward of the first high headland northwestward of Cape Upright, giving a good berth to the low rocks off the headland. Here there is good protection from southerly winds between S.W. and S.E., and landing can be effected on the beach. In the vicinity are some lakes of fresh water.

A small islet was shown on some charts about 8 miles northward of the eastern part of the island, but its existence is extremely doubtful.

Page 704.—Westward of Sugarloaf Cape the coast is low, and about 5 miles distant is *Spit Rock*, half a mile off shore; hence to Cape Gore the coast is mostly cliffy.

Glory of Russia Cape, the North point of St. Matthew, rises to an elevation of about 1,200 feet. It is now considered to be in about lat. 60° 30′ N., long. 172° 32′ W.

Sarychef Strait is about 2 miles wide, with rocks on either side, but is said to be clear in mid-channel. It is subject to strong tidal currents and rips.

Hall Island is 4½ miles in extent, and rises to an elevation of about 1,500 ft.; it is much frequented by sea-birds. A large rock lies off North Cape, and others lie off the southern coast. There is anchorage off the eastern side.

Pinnacle Island, about 9 miles S.W. by W. ¼ W. from the western part of Cape Upright, is nearly one mile long, and 900 ft. high, but only 200 yards wide, its steep shores rendering landing difficult. There are numerous rocks around it. As seen from the East, it appears like two rounded hills, with small pinnacle rocks off the N.W. end.

Page 704.—**PRYBILOV ISLANDS** have been the focus of much contention between the British and United States authorities regarding the pelagic or deep-sea seal fishery. The Russian and U. S. Governments both practically contended that Behring Sea belonged solely to those two nations, but, on this question being submitted to arbitration, the arbitrators, assembled at Paris, on August 15, 1893, decided mainly in favour of Great Britain, this sea being declared open to the vessels of all nations. Thus, neither Russia nor the United States have by right any exclusive privileges beyond the limits of the usual marine league from their shores.

The British and U. S. Governments, however, have since agreed to altogether prohibit the chase of the fur-seal within a zone of 60 geographic miles from any part of the islands; and it is also forbidden from May 1 to July 31, both inclusive, over the wide area bounded on the South by the parallel of 35° N. from the coast as far as the meridian of 180°, and on the West by this meridian as far North as 60° 40′ N., whence the boundary is a line to lat. 65° 30′ N., long. 168° 45′ W., in Behring Strait, and thence on this meridian to the northward. In the open season, only sailing vessels may be employed in this pursuit.

Both nations employ cruisers to prevent infraction of these regulations, the object of which is to avoid the extinction of these animals, by affording them a close time during the breeding season.*

In May 1890, the U.S. Government granted a 20 years lease of the right to kill seals on these islands to the North American Commercial Company, the annual take being limited to 100,000 skins, or 75,000 on St. Paul Island, and 25,000 on St. George. In recent years, however, the herds have so decreased, that the annual number killed has fallen to about 22,000. Since records have been kept, or from 1870 to 1904, the skins taken number about 2,250,000.

Persons are not allowed to land on these islands, without permission from the officials stationed there.

There are several anchorages around the islands, but vessels should not attempt to ride out a gale, unless lying to leeward, and well sheltered. A heavy surf soon rises on the weather side with such winds, rendering landing difficult or dangerous.

Tides, etc.—The currents around the islands are very strong and uncertain, being greatly influenced by the wind. It is high water, on full and change, at about 5h. 30m.; the range is about 3 feet. Normally, the flood stream sets eastward, and the ebb westward, with a maximum surface rate of 2½ knots, but below the surface it has been found to run as much as 5 knots. In the passages between St. Paul and Otter and Walrus Islands the surface current frequently runs 3 knots.

In 1900, the officers of the U.S.S. *Albatross* found the average surface temperature of the water around these islands to be 44° F., and at the bottom 35°, the latter in a current flowing constantly southward.

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* By an Act of Congress, dated December 29, 1897, citizens of the United States are prohibited at all times from the chase of the fur-seal in the waters of the Pacific Ocean North of the parallel of 35° N., including Behring Sea and the Sea of Okhotsk. This Act, however, does not apply to the regulations concerning the taking of seals on the Prybilov Islands.

At St. Paul Island, the recorded air temperature varies between extremes of 12° below zero and 62° F., but rarely exceeding 50°. Thick fogs are prevalent in summer round these islands, rendering the approach difficult and dangerous.

Two islands have been reported to lie to the southward and south-westward of the Prybilov Islands, but their existence is so extremely doubtful that they have been removed from the charts.

Pages 705-706.—**ST. GEORGE ISLAND**, used as a breeding preserve for the blue fox, rises to an elevation of 1,012 ft. at High Bluff, on its northern side, 2½ miles from Dalnoi Point. In thick weather, the sea-birds indicate its proximity, and in depths less than 30 fathoms great caution must then be exercised; the water must not be shoaled under 12 fathoms.

Dalnoi Point, the western extreme, is a precipitous cliff, and *Tolstoi Point*, its eastern extreme, is a bold promontory; with the wind against the tide, rips are formed off both.

Zapadni Bay affords good shelter from winds between E.N.E. and N.N.W., in 10 to 15 fathoms, about a quarter of a mile off shore, and northward of the reef extending about 2½ cables off the southern side. Boats land on the open sandy beach.

North Anchorage.—The village, about 3 miles westward of Tolstoi Point, contained about 100 inhabitants, and is now considered to be in lat. 56° 36′ 30″ N., long. 169° 32′ 15″ W. On the beach below it are two houses, which should be kept open in approaching, and vessels should anchor in not less than 10 fathoms. The beach is fronted by thick kelp, and landing is only possible with smooth water, when a flag is shown on the flagstaff.

In 1894, the U.S.S. *Concord* anchored on a patch of 17 fathoms, sand, 7½ miles N.E. by E. ⅝ E. from Tolstoi Point; a 3-fathoms patch, with kelp on it, has also been reported to lie about 9 miles eastward of the same point.

Off *Garden Cove* the bottom is mostly rocky.

Page 706.—**ST. PAUL ISLAND**, the resort of the fur-seal, is 12 miles in extent N.E. and S.W., and 4 miles across where widest, rising at its western end to an elevation of 633 feet. *Bogoslof Hill*, a conical crater peak near the centre of the island, is 590 ft. high, and near the eastern end is *Polovina Hill*, a conspicuous double-peaked hill. *Hutchinson Hill*, the N.E. extreme of the island, is connected with Polovina by a low narrow isthmus, known as *Sea Lion Neck*. The hill is fronted by rocks, marked by kelp; one, of 3 fathoms, lies nearly 1 mile N. by W. ½ W. from the shore, and another 1¾ mile E.S.E. of the eastern point. In 1895, a depth of 7 fathoms was found off the North shore, about 3 miles S.W. by W. ¾ W. from the hill, and there may be less water hereabout.

Reef Point is now considered to be in lat. 57° 0′ 30″ N., long. 170° 19½′ W., and should be very cautiously approached in thick weather. Masters of passing vessels are requested not to disturb the seals here by firing guns, or making any unnecessary noise.

The village contains about 250 inhabitants, and under favourable conditions boats can land in Village Cove, northward of the village, but there is a dangerous bar across it. With westerly winds, boats land close to a boathouse on the eastern shore of Reef Point, near Black Bluffs, eastward of the village. A flag is shown on the side an approaching vessel should anchor, and is then hauled down if landing be unsafe.

Should landing be impracticable either at Village Cove or Black Bluffs, it can sometimes be effected in a cove on the South side of Lukannon Bay.

The usual anchorage is in 9 or 10 fathoms, off Village Cove or Black Bluffs, according to the wind.

There are other anchorages around the island, as shown on the chart, and boats can land on both sides abreast Cross Hill. *S.W. Point* has a reef extending about 1 mile off it, and just to the eastward of it are some remarkable white patches on the cliffs.

Otter or *Bobrovi Island*, about 4½ miles S.W. by S. ½ S. from Reef Point, has two small craters on its East end, 150 ft. high, whence the land rises gradually to its West end, which is 288 ft. high and cliffy. Foul ground, with kelp and breakers, extends about 1 mile around its western part, its North side being clear of danger. There is anchorage in 9½ fathoms, sand, about half a mile N. by W. from Crater Point. In 1893, the U.S.S. *Albatross* made an unsuccessful search for the breakers reported to lie between this island and Reef Point, a depth of 26 fathoms being found at 1¾ mile N. by E. from the island; dangerous tide-rips sometimes form here.

Page 707.—**Walrus** or *Morjovi Islet* is 15 or 20 feet high, and, like Otter Island, is frequented by seabirds. A breaking reef extends about 2½ cables South of it, and both these islands must be very cautiously approached in thick weather.

There is anchorage in 10 to 15 fathoms around Walrus Islet, from 2½ to 5 cables distant. The best landing is in a cove at the S.W. end.

Off-lying Reefs.—In 1895, the U.S.S. *Corwin* found a depth of 35 fathoms in the position of the 5-fathoms shoal said to lie 7½ miles westward of the high bluff at the western end of St. Paul Island. Overfalls and swirls were noticed hereabout.

In 1894, the U.S.S. *Ranger* made an unsuccessful search for the kelp bank said to lie about 16 miles E.N.E. of Hutchinson Hill, depths of 28 to 34 fathoms, sand, being found around the given position.

The rock or shoal, said to lie about 90 miles N.E. by E. ½ E. from the N.E. point of St. Paul Island, was searched for in vain by the U.S.S. *Thetis* in 1889, and other authorities also deny its existence.

Page 707.—**The COAST of ASIA.—The Russian N.E. Coast Province** of Siberia is now divided into six *Districts*, as follows:—*Anadyr*, with the seat of government at Markovo; *Petropavlovsk* (or *Kamchatka*), capital Petropavlovsk; *Gishiginsk*, capital Gishiga; *Ochotsk*, capital Ochotsk; *Uda*, capital Nikolaievsk; and *Commander Islands*, capital Nikolski. The charts of this coast remain very imperfect, being mere sketches for the most part. Many of the positions are inaccurate, especially as regards the longitude.

Beyond the production of valuable furs, now much diminished, this region has hitherto been of little or no commercial importance; but its valuable sea and river fisheries, forests of good timber, and metallic deposits, should ultimately bring it into greater prominence, notwithstanding its inclement climate. At the census in 1897, the population of the five northern districts amounted to only 32,673, showing a great diminution, owing to occasional famines and disease.

The Anadyr District comprises the north-eastern extreme of the Russian territory of Siberia, and is bounded on the South by the River Tymlaty, which enters the sea in about lat. 59° 53′ N., in the gulf northward of Karaghinsky Island. Though its area exceeds that of Germany, the population in 1897 was estimated to number only about 12,000, the seat of government being at Markovo, up Anadyr River. The inhabitants live by fishing, and the chase of deer and fur-yielding animals. Whales, once so plentiful in these seas, are now scarce.*

The climate of the Anadyr District is very inclement, winter lasting from September to May, but along the coast it is ameliorated by the influence of the warm current from the South. The summer is short, cold, and rainy, with fogs along the coast, and strong winds prevail throughout the year, chiefly from the N.E. Owing to the warm southerly current, the southern coast of the Tchukotskoi peninsula (northward of Anadyr Gulf) becomes free from ice by the end of April, while the remainder of the country is icebound.

Russian Uniform System of Buoyage.—See Addenda for page 725.

Page 708.—**CAPE NORTH,** when visited by the *Vega*, was observed to be in lat. 69° 4′ N., long. 179° 32′ E. It consists of two rounded hills, connected with the coast by a low isthmus.

Cape Wankarem, in long. 176° 28′ W., was visited by the U.S.S. *Corwin* in 1881. It is a bold granite headland about 80 ft. high, on the West side of a river, where there was a village. The tide here rose and fell about 2 feet. Hence to Cape Onman, about 50 miles eastward, the coast is very low, but about 10 miles from the latter cape a mountain rises abruptly 5 miles inland. *Cape Onman* is described as a precipitous rock about 1,000 ft. high, with a village near it.

Large quantities of drift-wood are said to come ashore in *Koliutchin Bay*.

EAST CAPE, now known to the Russians as *Cape Deschnev*, rises to an elevation of 2,521 feet. With off-shore winds, there is good anchorage in 8 fathoms off the North and South sides of the swampy flat connecting it with the main; also in 10 fathoms, mud, off the village on the face of the cape.

Pages 708-710.—**ST. LAWRENCE BAY** has a sandy bar of 8 to 10 fathoms extending across its entrance between Cape Nunyamo on the N.E. and Cape Novosilski

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* For a complete account of Anadyr and the other eastern Siberian districts the reader is referred to "Russland in Asien (Band V.): Das Nordöstliche Küstengebiet," compiled mainly from Russian sources by Major-General Krahmer, 1902. See, also, "In Search of a Siberian Klondyke," by W. B. Vanderlip and H. B. Hulbert, 1903.

or Krleougoun on the S.W.; the latter cape is now considered to be in lat. 65° 28½′ N., long. 170° 54′ W., and rises to a dome-shaped hill, 1,642 ft. high.

Page 711.—**METCHIGME BAY** has 14 fathoms in the narrow entrance, and the officers of the U.S.S. *Corwin* state it is an excellent landlocked harbour, with not less than 5 fathoms for several miles up.

Page 713.—**Arakam or Ka-y-ne Island.**—*Cape Kyghynin* or *Kuiguinin* is now considered to be in long. 172° 4½′ W.; it should be given a wide berth, the U.S.S. *Thetis* having found shoal and uneven soundings off it.

Page 714.—**Ittygran or Chirluk Island.**—The officers of the U.S.S. *Corwin* reported the existence of a rocky 2½-fathoms shoal in the channel between Ittygran and Nouneangan Islet.

Page 714.—**Cape Tchaplin, or Indian Point,** is a rendezvous for whalers and trading vessels. The U.S.S. *Thetis* was here in 1889, and found a depth of 9½ fathoms at 1½ mile East of it; the vessel anchored half a mile northward of the village of *Oumwadjik*, in 7½ fathoms, hard sand and gravel. There is said to be similar anchorage off the South side. The village contained about 350 inhabitants, some speaking English, and there was a store here, supplying flour, potatoes, tobacco, etc., but no wood or fresh water could be had.

Page 716.—**PORT PROVIDENCE.**—Discoloured water has been observed in the entrance; and, in 1890, Capt. Brooks, steamer *Beluga*, reported a rocky 2-fathoms shoal a short distance south-eastward of *Lisaja-golowa* or *Balls Head*, the reddish eastern point of the entrance. The *Plover* anchored in 9 fathoms, in the bay East of it.

Plover Bay.—No supplies could be had here in 1891, and the coal depôt probably no longer exists. The observation spot is now considered to be in lat. 64° 21′ 37″ N., long. 173° 18′ 30″ W.

In May and again on June 11, the U.S.S. *Corwin* found Plover Bay still frozen up. The *Plover* was frozen in from October 19 to June 30.

Page 718.—**Cape Meetchken** was reported by Capt. Smith, whaler *Ballena*, 1888, to have a 3¼-fathoms shoal about 2½ miles westward of it.

Page 719.—**ANADYR BAY** forms a large shallow bight, the South shore of which is very low and has not been examined. Between Russian Spit and Geka Point the entrance is about 12 miles wide, with 5½ to 10 fathoms in it, the channel shallowing within, and passing on either side of *Raid Bank*. *Geka Point* is low, and has a village on it. About 27 miles W.N.W. of the entrance is *Cape Alexander*, on the southern side of the approach to Anadyr River, with the Russian settlement named *Novomarinsk*. There is anchorage in 6 to 7 fathoms, mud, midway between Cape Alexander and Observation Point; here the tide runs about 4½ knots. The bay is frozen from September to June.

Anadyr River bar has only about 2½ ft. over it, at low tide, but boats can reach the Russian settlement of *Markovo*, with 340 inhabitants, in about lat. 64° 50′ N., long. 170° 30′ E., or about 230 statute miles from the sea, there being at least 7 feet in the river channel. The river is usually frozen up at the beginning of October, and is not clear of ice till the middle or end of June. Forests of good timber are found in its upper parts, above Markovo. When the snow melts, the river rises 15 to 20 ft. above its usual level.

Ugolnoi Bay is open to the eastward, with depths of 15 to 16 fathoms across its entrance. In lat. 62° 59′ N., long. 179° 21′ E., is the mouth of the *River Lakhtina*, with 7 ft. over its bar, off which there is anchorage in 5 to 10 fathoms. There is also anchorage in 10 fathoms, in the S.E. angle of the bay.

Page 720.—**Archangel Gabriel Bay** is about 10 miles in width, and 6 miles in depth, with the extensive *Orianda Lagoon* at its head.

CAPE NAVARIN.—The mountain on the point is 1,690 ft. high.

Cape Govenski, the eastern point of Baron Korf Bay, is now placed in lat. 59° 47′ N., long. 165° 55′ E., with a sunken rock off it.

BARON KORF BAY is 30 miles in width between Cape Govenski and Cape Ilpinski, and within this line extends 47 miles northward, terminating at its head in *General Skobelef* and *Sibir Harbours*, which are sheltered by projecting tongues of land, affording good anchorage in 10 fathoms or under. There is a village here, with a seal fishery. There is also anchorage in *Gek Bay*, northward of Cape Ilpinski. The

River Vivinski debouches on the western shore, with 15 ft. over its bar, and coal has been found along the coast to the north-eastward of it. Around *Jaigwyn Bay* are some thick deposits of pure sulphur.

Page 721.—*Verkhoturoff* or *Verkhotoursky Island* is now considered to lie in about long. 164° 38′ E., and is about 1,000 ft. high. A spit of gravel extends off the N.W. side, and here were some huts of fox-hunters from the coast. *Okimkan Rock*, about midway between this and Cape Ilpinski, is about 100 ft. high.

Pages 721-723.—**COMMANDER ISLANDS,** discovered by Behring in 1741, were then uninhabited; but in more recent years, the Russians formed settlements of Aleuts on them, from Atkha and Attu Islands, the population now numbering about 650. Their only commercial importance consists in their produce of the skins of the seal, blue fox, and sea-otter, which are all most strictly preserved, the latter on Copper Island. The seal-fishery is now leased (since 1891) by the Russian Seal Skin Company, which is entitled to take not more than 30,000 skins annually, but the average produce is less. The company has the sole right of trading on these islands, fishing, hunting, and trading being strictly prohibited to others, under penalty of confiscation of their vessels, etc.*

By agreements with Great Britain and the United States, in 1893-4, sealing vessels of those nationalities are forbidden to take seals within a distance of 30 miles of the coasts of these islands, or within 10 miles of the Siberian coast, and cruisers patrol during the season when the seals frequent them, or from May to November.

The great sea-cow, described by the early visitors, was in a few years exterminated, for the sake of the meat, and is now extinct; the sea-lion, also, is now rarely seen. The sea abounds with cod; salmon is plentiful in the streams of Behring Island; and the reindeer, introduced on this island in 1882, now run wild in large numbers. Potatoes and turnips have been grown, but not in any quantity. Mosquitos are troublesome in summer.

The islands are destitute of trees, but there are bushes of willow, rhododendron, heath, etc., and in parts grass and herbage grow luxuriantly. Lignite has been found on Behring Island, but coal and firewood is all obtained from Petropaulski. No supplies or coal were to be obtained here by passing vessels. A government doctor is stationed at Nikolski.

The Climate of these islands is disagreeable, but not unhealthy, owing to its cloudiness, fog, heavy rainfall, and low summer temperature. In winter there are heavy falls of snow, with fierce gales. Drift-ice has been seldom seen of recent years in their vicinity. Observations show a maximum shade temperature of 63° F., and the thermometer rarely falls below zero.

The Currents around the islands are uncertain, being chiefly dependent on the direction of the prevailing winds.

The islands have not been accurately surveyed, the chart being little more than a sketch, and must be used with extreme caution.

BEHRING ISLAND has an average width of 8 or 9 miles, but has no good harbour or sheltered anchorage, and its shores are mostly fronted by reefs. The northern part is much lower than the southern, its highest point being here only 617 feet. There are two seal rookeries on this island, the principal one being around Cape Yushin, the North extreme; the other one is about midway along the western coast, in lat. 54° 57′ N.

Cape Manati, the S.E. cape, rises in a bold cliff 600 ft. high, in about long. 166° 40′ E., but reefs are said to extend 3 miles E.S.E. from it. Hence the cliffy coast trends about 14 miles N. by W. ¼ W. to *Tolstoi Point* or *Cape Hitrova*, from which *Cape Vaksel* bears N.W. by N. ½ N., distant 25 miles. At 3 miles north-westward of Tolstoi Point is *Polovina Cove*, where Behring died and was buried.

Staraya or *Old Harbour*, about 5 miles southward of Cape Vaksel, is a cove between two reefs, with depths of 2½ to 5 fathoms, sand, but is only fit for small vessels. The water is said to be smooth in it, even with N.E. winds. There is no village here now.

Reefs are said to extend 3 miles off Cape Vaksel. At 7 miles eastward of it is the mouth of *Saranna River*, abounding with salmon, and running from a large lake, 40 ft. above sea-level. In summer there is a fishing settlement here.

Page 722.—**Cape Yushin** or **Severni Mys,** the northern extreme of Behring Island, is about 30 ft. high, fronted by a beach, and a reef of volcanic rocks extends half a mile northward, terminating in a rock 10 ft. high. Shoal water is said to extend nearly 2 miles off the cape. The seal-skin salting house on the cape is conspicuous, being of

* An interesting account of these islands, and their marine visitors, will be found in "The Russian Fur-Seal Islands," by L. Stejneger, issued by the United States Commission of Fisheries, in 1896.

a reddish brown colour, and bearing S. by W. will lead to the anchorage in 7 to 10 fathoms, eastward of the reef, safe with winds between S.E. and S.W., round by South. A good masthead look-out must be kept for the many scattered rocks.

The N.W. point of Behring Island is a low projection in about lat. 55° 17′ N., long. 165° 44′ E., with a dangerous breaking reef extending 3½ miles off it. To avoid this, and those off the North coast, the shore should be given a berth of at least 4 miles.

NIKOLSKI, 9 miles S.E. by E. from the N.W. point, is the residence of the governor of the islands, and consists of a group of gaily painted wooden buildings, the church having a bright green roof and a yellow dome, in lat. 55° 12′ N., long. 165° 59′ E. Inland are some remarkable flat-topped hills. The anchorage is in 7 to 10 fathoms, sand and stones, north-westward of the village, but is exposed to the swell, and is unsafe with southerly and westerly winds.

Ari or *Sivuchi Islets*, 7 miles westward of Nikolski, are two in number and conspicuous, the northern one being about 150 ft. high, and the southern one is low. *Toporkoff Islet*, 4⅔ miles eastward of Ari Islets, is about 30 ft. high; *Polovintchaty* or *Midway Rock* always appears above water. In 1904, breakers were seen about half a mile westward of Toporkoff, from the U.S.S. *Buffalo*.

Vessels approaching Nikolski anchorage are recommended to keep southward of a line joining Ari and Toporkoff Islets, and passing 3 cables southward of the latter, steer about E. by N. ½ N. for the anchorage. This district has not been accurately surveyed, and other dangerous rocks are said to exist besides those shown on the chart. It is high water, on full and change, at about 4h.; springs rise 4¾ ft., neaps 3¼ feet.

Pages 722-723.—**MEDNY or COPPER ISLAND** varies from half a mile to 4 miles in width, its peaked mountains varying from 1,000 to 1,925 ft. high, reaching the latter elevation above Preobrazenskoye, the principal village. Its shores are mostly precipitous, with narrow beaches, but rocky reefs are stated to extend 2 or 3 miles off the N.W. and S.E. extremes. The native copper is found in nuggets, near the N.W. end.

Preobrazeniya Harbour, 5 miles south-eastward of the N.W. point of Medni Island, is a creek only suitable for small vessels, which can winter here. The village has a pleasant appearance, but is shut in by precipitous mountains; the church is in lat. 54° 48′ 30″ N., long. 167° 29′ E. There is anchorage off the harbour, in 14 to 20 fathoms, with the church in line with a conspicuous pinnacle rock. More sheltered anchorage will be found in 3 to 12 fathoms, sand, in the N.W. part of *Peschanoi Bay*, N.W. of the harbour, but there is nearly always a swell here, and landing is difficult.

In summer, the natives migrate to the summer villages of *Karabelni* and *Glinka* on the N.E. coast, for the seal fishery, the rookeries being on the opposite or S.W. coast.

Near the coast, about 2 miles eastward of the harbour, is *Sivuchi Rock*, 70 to 80 ft. high, often visible when the hills are clouded over.

Glinka Bay, 6 miles from the S.E. end of the island, affords good shelter in 7 fathoms, with winds between S.S.E. and North, round by West.

Kitolovnaya Shoal, of 2 fathoms, is said to lie 11½ miles N.W. by W. from the N.W. end of Medni Island, but its position is doubtful.

Pages 724-725.—**KAMCHATKA PENINSULA** now forms the political district of Petropaulovsk, bounded on the North by the Rivers Tymlaty and Liessnaja. At the census in 1897, the population numbered 8,365. The charts are still very imperfect and unreliable, but additional information was obtained in 1882 by the officers of the Russian cruiser *Africa*.*

Between the Tymlaty and Cape Ozernoi, a wide expanse of marsh and moorland separates the inland mountains from the sea, but between Cape Ozernoi and Cape Lopatka, the coast consists of a series of magnificent cliffs, fronted by off-lying rocks, and backed by lofty mountains with conical volcanic peaks, usually shrouded by cloud and mist. The principal volcanoes are about 40 in number, of which 14 are active, and the remainder now extinct.

Winds, &c.—In summer, the winds along the eastern coast of Kamchatka are usually southerly, and dense fogs then prevail. In September there is not so much fog, and in October westerly and N.W. winds prevail, bringing clear bright weather. The movements of the barometer appear to be of little use here as a guide to coming weather.

Page 725.—Kamchatka River is encumbered with numerous shallow sandbanks above its entrance, navigation being difficult, even for boats.

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* In 1895-1898, a Russian government expedition made an exhaustive study of these little-known regions, the results being published (in the Russian language) in two finely illustrated volumes, entitled "Okhotsko-Kamtchatskii Krai," by Dr. H. V. Sliunin, 1900.

Uniform System of Buoyage.—On the Siberian coast, *spar* buoys (where used), are arranged on the following system :—

In channels having a general North and South direction, the outer dangers are marked by *black* and *white* buoys, bearing *two black brooms*, points together, on their West side ; and by *red* and *white* buoys, with *two red brooms*, bases together, on their East side. Inner dangers are marked by *red* and *white* buoys on their East side ; and by similar buoys, bearing a *black broom*, point down, on their West side.

In channels having a general East and West direction, *red* buoys with a *red broom*, point up, mark the South sides of the outer dangers ; and *white* buoys, with a *black broom*, point down, mark the North sides. Inner dangers are marked by *red* buoys, with a *red broom*, point up, on their South sides, and by *white* buoys on their North sides.

An outer *black* buoy, bearing a double cross and ball, or an inner *red* and *white* buoy, bearing a cross, denote dangers which may be passed on either side.

All buoys are removed when navigation is closed by ice.

Pages 725-726.—**KARAGHINSKY ISLAND** resembles the form of a fish in its outline, facing N.E. It has a few inhabitants, living by the chase of the reindeer, fox, bear, seal, and walrus ; they are said to have originally come from the mainland across the ice formed during a specially severe winter.* The lower grounds have thickets of dwarf pine, mountain ash, alder, and willow, with grassy glades and berry-bearing and flowering plants, but the mosquito abounds in summer.

A breaking reef extends about 6 miles S.S.E. from *Cape Krachenninikoff*. The open bay between this and False News Bay affords anchorage in 6 to 9 fathoms, muddy sand, from half a mile to 1 mile off shore.

Page 726.—**Lozhnuikh Vyestei** or *False News Bay*, sheltered by the gravel spit terminating in Cape Sémenoff, is open only to winds between South and West, affording good anchorage in 4 to 8 fathoms, mud. There are a few scattered huts and an old store-house here. It is high water here, on full and change, at about 7h. 30m. ; Lütke observed the tide to rise 8 to 10 feet.

In 1904, the officers of H.M.S. *Algerine* reported the existence of a 4½-fathoms patch between the island and the coast, at about 7 miles S. ¾ W. from Cape Kouzmichtcheff.

Page 726.—**KARAGA HARBOUR** has not yet been properly surveyed, and its western shore is fronted by wide shoals. The entrance is about 2 miles wide between the long sand-spits on either side, the bar having depths of 3 to 4 fathoms over it. There is sheltered anchorage in 7 to 9 fathoms, mud and sand, within the northern sand-spit. In 1897, H.M.S. *Linnet* found 3 fathoms on the bar, and anchored in 4 fathoms, southward of another sand-spit, extending from the eastern shore, 3½ miles up the bay.

On *Seleniya Point*, opposite the entrance of Karaga River, is a small village, the natives of which are a mixed race, but very friendly, and some could speak Russian. Salmon abounds here, the people depending on this, seal, and berries for their food. Mosquitos are very troublesome in summer. Landing is difficult, except at high water.

Ukinsk Bay is the extensive bight southward of Karaga Harbour. In its S.W. angle is the mouth of *Uka River*, about 10 miles up which is the village of *Ukinsk* ; in 1905, Capt. Hoffman found a Japanese military station at the entrance, and in entering found a depth of about 2 fathoms over the bar at high water, and anchored inside in 6 fathoms.

The mountain on *Cape Natchikinskoi* is now considered to be in about long. 162° 45′ E. *Cape Ozernoi*, when passed by H.M.S. *Linnet*, was observed to have a breaking reef extending about 1½ mile north-eastward from it.

Page 727.—**Cape Africa**, 35 miles southward of Cape Ozernoi, is in about lat. 56° 6′ N., long. 163° 25′ E., terminating in a sandy spit, extending about 1 mile seaward, and the cape is remarkable by a solitary peak about 1,200 ft. high. Hence to Cape Kamchatskoi the coast is mountainous and cliffy.

CAPE KAMCHATSKOI, about 16 miles S.W. ½ W. from Cape Africa, rises in mountains about 1,500ft. high, and terminates in a sand-spit extending about 1 mile S.E., strewn with large rocks, and at its extremity is a pile of rocks about 40 ft. high, appearing like a castle with turrets. A sunken reef is stated to extend 2 miles farther seaward.

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* An interesting account of these primitive people will be found in the "Geographical Journal," September, 1898, in a description of a visit to this island and Karaga Bay, in H.M.S. *Linnet*, 1897, by Messrs. G. E. H. Barrett-Hamilton and H. O. Jones.

From Cape Kamchatskoi the precipitous coast extends 8 miles westward, to a conspicuous dark grey cliff about 450 ft. high, at the entrance of *Belaya* or *White River*. In the cove northward of this cliff, there is anchorage in 15 fathoms, exposed to the swell from the South.

KAMCHATKA RIVER, the largest of the peninsula, has a course of about 350 statute miles, but is useless for general navigation, being encumbered with shallow banks. About 280 miles up it is the large Russian settlement of *Milkovo*, in lat. 54° 45′ N., long. 158° 10′ E.; lower down, at the foot of the Klutchevskoi Volcano, is another Russian settlement named *Kljutschevskoie*, where some amount of cultivation is carried on, and cattle are kept. The river abounds with excellent salmon, and there are forests of larch timber on its banks. In June, the floods caused by the melting snow rise 9 ft. above the ordinary level at the entrance. The entrance becomes frozen over in November, and is sometimes not quite clear of ice till the end of June.

The entrance is fronted by a long bank of sand and stones, through which the river forces a narrow shifting channel, with a depth of about 6 ft. at low water, deepening within to 20 and 30 feet. Vessels drawing 8 or 9 ft. can enter at high water, under the guidance of the pilot, for whom a boat must be sent, only at or near high water, as the bar would be dangerous for boats at any other time. The village, with its high wooden watch-tower, will be seen over the spit, off which there is anchorage in about 7 fathoms, with the tower bearing N. ½ W. It is high water, on full and change, at about 4h., and the usual rise is 6 ft.; the tidal streams run strongly in the river.

The village at the entrance is now known as *Ust-Kamtschatsk*, and a few Cossacks are stationed here. Cattle are kept, and a little cultivation is carried on, but the people live chiefly by hunting and fishing. *Nishni Kamtschatsk*, 35 miles up the river, is now of no importance.

Klutchevskoi Volcano had a severe eruption in 1896-7.

Page 728.—**The GULF of KAMCHATKA** is comprised between Capes Kamchatskoi and Kronotskoi, and little is known of it beyond what appears on the chart. *Cape Kronotskoi* is now considered to be in lat. 54° 48′ N., long. 162° 8′ E., and *Cape Kosloff* is about 23 miles S.W. ½ S. from it.

The GULF OF KRONOTSKOI is comprised between Capes Kosloff and Shipunskoi, and the Russian chart shows several anchorages along its coast, but no description is available. *Joupanoff Volcano* is also known as *Jurnanowa*.

Betchevinskaia Bay, about midway between Capes Shipunskoi and Nalatcheff, is a narrow inlet 5 miles in extent, leading to a landlocked basin, which is approached through a narrow deep passage between two spits. Between this and Avatcha Bay the coast is mostly low and sandy, with the mouths of several streams.

Page 730.—**DALNI POINT Lighthouse** is a white wooden octagonal tower 40 ft. high, erected 280 yards E. by N. ¼ N. from the position of the occasional light (now discontinued). It shows a *fixed bright* light, elevated 327 ft., and visible 23 miles seaward between N. 63° E. and S. 51° W., but is not exhibited in winter, or from November to May. In foggy weather, a *Bell* is struck *twice* quickly at intervals of not more than 3 *minutes*. A *Gun* is also fired at intervals of 5 to 10 minutes, when vessel's signals are heard.

The lighthouse is now considered to be in lat. 52° 52′ N., and is stated to have no telegraphic communication with Petropaulski. A reef extends about 1½ mile southeastward from the point.*

Page 731.—**Winds, &c.**—Observations recorded over a series of 6 years at Petropaulski, show that the prevailing winds are from N.E., N.W., North, and West, the most stormy season being from November to April. In summer, S.W., S.E., East, and South winds are prevalent. The mean temperature varied between 2½° F. in February and 54° in August, and the average annual rainfall was 43¼ inches. Snow fell in every month except July and August. The inner harbour is usually closed by ice from the middle of November to May or June, but the roadstead remains free much longer. The sea does not freeze in the offing.

Korjazkaia Volcano, or the *Mountain of Avatcha*, in lat. 53° 19′ N., is 11,550 ft. high; it was in violent eruption in the autumn of 1895 and in July, 1901, the latter outbreak covering the whole of southern Kamchatka with ashes.

Page 733.—*Rakovya Shoal* buoy is discontinued.

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* The attack on Petropaulski is commemorated by an obelisk about 25 ft. high, on the spit near the town.

Page 734.—*Tides.*—At Petropaulski the tides are very irregular; at full and change there appeared to be only one high and one low water in the 24 hours.

PETROPAULSKI, or Petropavlovsk, the capital of Kamchatka, is said to have a very dilapidated appearance, and the mud renders the only thoroughfare almost impassable in wet weather. The inhabitants number only about 400, though this town is the seat of the fur and other trade of this coast, now in the hands of the Russian Seal Skin Company. Small supplies of beef, butter, vegetables, and bread might be had here, and there is a government coal store for the Russian patrol and mail steamers. Fresh water can easily be obtained from a stream about 6 cables S.E. of Shakoff Point.

A *fixed bright light*, visible about 7 miles between S. 36° W. and S. 84° W., is shown on the East side of the entrance of the inner harbour. In foggy weather, signals are made by *Bell* and *Gun*, as at Dalni Point.

The inner harbour is about half a mile in diameter, but the navigable entrance is only about 50 yards wide between the flats on either side, with about 6 fathoms water. A vessel would here lie landlocked in 6 to 7 fathoms, soft mud, in which anchors are apt to drag during heavy northerly squalls from the mountains.

The outer roadstead affords good anchorage in 7 to 8 fathoms, mud, sheltered by the reef extending 3 cables south-eastward from Shakoff Point, which was marked by a buoy.

Page 735.—**Utashud** or *Powell Island* lies south-westward of Cape Jelti, in about lat. 51° 33′ N., long. 157° 50′ E., abreast of *Itterna* or *Ilina Volcano*. It is about 2 miles long, and shelters the small bay where the yacht *Marchesa* anchored; there was a village here, but the people were removed to Behring Island in 1888.

CAPE LOPATKA or Kapuri is now considered to be in about long. 156° 43′ E., and terminates in a narrow point of grassy sandhills. A dangerous reef extends about 9 miles north-westward from it, with a few rocks awash on it, and separated from the coast by a navigable channel, with 7 to 15 fathoms in it.

Page 736.—**The KURILE ISLANDS** are known to their Japanese owners as *Chisima* (Thousand Islands). A great deal of valuable information concerning this desolate region has been published by Captain H. J. Snow, F.R.G.S., gained during his 15 years of fur-hunting among them, in the course of which he visited and circumnavigated each of the islands. He found great discrepancies in the charts and written descriptions of them, and we here give the more important observations, referring the reader to his most interesting "Notes on the Kurile Islands," 1897.*

The islands are 23 in number, with several groups of rocks, their area being estimated at 2,860 square miles. With the single exception of Shumshir, they are all mountainous, the elevations ranging from 1,360 ft. on Ushishir to 7,640 ft. on Alaid. The islands are of volcanic origin, volcanic peaks being found on all the islands except Shumshir, and about twenty (chiefly in the northern islands) show signs of activity, discharging lava, steam, and ashes. Hot springs are also numerous, and earthquakes frequent, both on shore and in the waters adjacent.

The islands were all inhabited by Ainu, a quiet peaceable people, fast diminishing in numbers; in 1891 the inhabitants numbered only 2,886, at least three-fourths Japanese, and all living on Yetorup, Kunashir, and Shikotan, the other islands being uninhabited.

The practical value of these islands lies in the fisheries. The lakes and streams abound with salmon and trout, while the seas around all but the central islands swarm with cod, herring, halibut, etc. The fur-seal and sea-otter are now all but extinct, but bears and foxes abound. Sea-birds are numerous. In summer, mosquitos and other insects are very troublesome on the wooded islands.

Kunashir, Shikotan, Yetorup, and Urup have woods of pine, birch, willow, etc., the first-named island yielding some fine timber, but that on the others is stunted. North of Urup the only trees to be found are on the north side of Ketoi. The lower slopes of the hills are usually covered with grass and moss, amongst which wild flowers are abundant. In summer, the shores are fringed with vast beds of kelp and other seaweed.

The Climate is moist, and fog is almost constant during the summer, only disappearing with fresh N.W. winds; there is, however, usually clear weather on the lee side of the islands. The spring is cold and boisterous, the autumn being the finest season, when bright, clear weather, with westerly winds, may continue until the middle of November. The winter is cold, with prevalent N.W. winds. Heavy gales occur at all

* See, also, "The Flora of the Kurile Islands," by K. Miyabe, in Vol. IV. of the "Memoirs of the Boston (U.S.A.) Society of Natural History," 1890, pages 203-275.

times of the year, and Capt. Snow states that, from his experience, between the middle of April and the middle of October, they mostly finished at N.W., the wind backing from the S.E., through East and North, May being the most stormy month. Great care is necessary to avoid the squalls from the mountains. The barometer always gives warning of the approach of a storm.

The Tides are often irregular, the rise varying from 3½ to 6 feet. The flood sets north-westward through the channels, and the ebb southward; the tidal streams at times run 4 or 5 knots an hour through them, causing dangerous tide-rips.

Ice, from the northern part of the Okhotsk Sea, appears off the N.W. sides of the southern islands about the middle of February, and blocks the coasts and straits, but usually disappears through the straits by the middle of May.

Owing to fog, uncertain currents, and unsurveyed waters, the navigation among these islands presents many difficulties to strangers. Those familiar with them find useful guides in the kelp, the cries and appearance of the sea-birds and sea-lions, the volcanic sulphur fumes, etc. Close inshore the ship's compasses may be affected in the vicinity of some of the volcanoes, especially at the N.E. end of Yetorup, the Black Brothers, and the S.W. end of Simushir.

Page 737.—**ALAID** is about 26 miles in circumference, its graceful extinct volcanic cone attaining on elevation of 7,640 feet. There is anchorage in 9 to 15 fathoms off its S.E., East, and North sides. Some prolific cod banks N.W. of it were discovered by fishermen from San Francisco.

SHUMSHIR or Shimushu Jima, consists of swampy valleys and undulating hills, attaining an elevation of 580 ft. at its northern end. It is now uninhabited. *Cod Bay*, the sandy bight on its N.W. side, offers fair anchorage in 10 to 15 fathoms; it is high water here, on full and change, at about 6h., and springs rise 6¾ feet. A reef extends nearly a mile off the rocky S.W. point of the bay.

Kokskar Rock, or *Shiro Iwa*, lying about 6 miles off the S.E. point of Shumshir, is a black mass 15 or 20 ft. high, frequented by sea-lions. A rock awash lies 2 miles N. by E. ¾ E. from it, and breakers have been observed between. In 1905, a breaking shoal was reported about 4½ miles N. 30° E. from Kokskar.

PARAMUSHIR.—*Fuss Peak*, a magnificent isolated extinct volcanic cone, 6,900 ft. high, is in long. 155° 12′ E., and about 10 miles E.N.E. of it is *Mount Chikuratski*, another fine peak, 6,400 ft. high. *Cape Henry*, the S.E. point, is low, with reefs and rocks extending nearly 2 miles off it; there is anchorage in 12 to 16 fathoms, westward of the cape.

Paramushir or Little Kurile Strait is deep, but subject to strong tidal streams, sometimes running 4 or 5 knots at springs. In 1901, a sunken rock of 1¼ fathom was reported to lie 4 cables off Naga Point, on the East side of the narrow part of the strait.

Torishima or *Bird Rocks* are three in number, connected by reefs; *Ganimushir*, the S.W. rock, is 134 ft. high, the others being lower.

Shirinki lies about 5 miles W.S.W. of the base of Fuss Peak, and rises to an elevation of 2,500 feet. It is about 2 miles long, by 1 mile wide, its centre being in lat. 50° 12′ N., long. 155° E. There is anchorage in 10 to 15 fathoms, rocky bottom, off the North shore.

Page 738.—**Makanrushir** is of roughly oval form, 6 miles in extent North and South, consisting of an irregular assemblage of mountains attaining an elevation of 3,900 feet. Its summit is in lat. 49° 46′ N., long. 154° 24′ E.

Avos Rock lies about 9 miles W.S.W. of the south-western end of Makanrushir, and is a whitish steep bare rock about 200 ft. high, with some smaller rocks near it. In 1906, heavy breakers, about a mile in extent, were observed from the Italian warvessel *Marco Polo*, at about a mile N.N.E. of Avos Rock.

ONEKOTAN has two conspicuous volcanic peaks, *Mount Blakiston*, 4,400 ft. high, in its S.W. part, and *Mount Nemo* 3,300 ft. high, near its northern end. *Cape Krenitzen* is now placed in lat. 49° 17′ N., long. 154° 37′ E. *Nemo Bay*, southward of the N.W. point, affords fair anchorage in 10 to 13 fathoms, and a stream of good water runs into it. There is also anchorage in 9 to 12 fathoms, sand, in *Blakiston Bay*, near the middle of the East side of the island.

Amphitrite Strait is 28 miles wide, and in thick weather vessels should give a wide berth to the low rocky points on the Paramushir side.

KHARIMKOTAN is 6 miles in extent N.W. and S.E., and 3½ miles wide, its double truncated cone rising near its centre to an elevation of 4,050 ft., in lat. 49° 10′ N., long. 154° 28′ E. The N.W. part is low and marshy, and the East end is a low lava point; otherwise the coast is cliffy, and more free from reefs than the other islands. On the eastern side of the N.W. point is a sandy bay, with anchorage in 6 to 12 fathoms; fresh water and driftwood can be obtained here.

SHIASHKOTAN, 15 miles S.W. of Kharimkotan, consists of two mountainous masses united by a level isthmus about half a mile wide, and 80 to 100 ft. high. The northern mass rises to two peaks 3,030 and 3,070 ft. high, from one of which vapour still issues. The southern mass is 2,950 ft. high, and on its western side is a steaming crater. The best anchorage is in *Otomé Bay*, on the N.W. side of the isthmus, in 10 to 14 fathoms, sand; fresh water and driftwood can be had here. There is also anchorage off the North shore, in 9 to 15 fathoms; and in 15 fathoms, sand, on either side of the reef extending off the eastern side of the isthmus, which is in lat. 48° 52′ N., long. 154° 2′ E.

Ekarma, 3½ miles off the N.W. point of Shiashkotan, is 3½ miles in extent, East and West, and its N.W. part rises to an extinct volcanic peak, 4,150 ft. high. Its shores are mostly cliffy, but there is anchorage off the S.E. side, in 10 to 15 fathoms, hard bottom.

Chirinkotan, in lat. 49° 3′ N., long. 153° 26′ E., is about 4 miles in circumference, and rises in a double cone 2,400 ft. high, giving vent to vapour and at times lava flows down to the sea.

Mushir Rocks lie 11 miles off the S.W. end of Shiashkotan, on a reef in the form of a crescent, open to the westward, and about 1½ mile in extent. *Bluff Rock*, the highest and central, in lat. 48° 37½′ N., long. 153° 48′ E., and *Seal Rock*, at the S.W. extreme, are about 140 ft. high; *Long Rock*, at the northern end, is about 80 ft. high. There is anchorage on either side of the northern part, in 10 to 15 fathoms, rocky bottom, but the tidal currents are strong. These rocks were formerly a resort of fur-seal.

Raikoke is about a mile in diameter, being an extinct volcanic cone 2,050 ft. high, in lat. 48° 20′ N., long. 153° 6′ E. It is a great resort of sea-lions, and there was a fur-seal rookery on its West side. A vessel might anchor off its South side, in 13 to 16 fathoms.

Matau, 9 miles southward of Raikoke, is about 6½ miles in extent N.W. and S.E., rising in a magnificent cone 5,120 ft. high, in lat. 48° 8′ N., long. 153° 4′ E., giving vent to vapour and occasional streams of lava. Its S.E. part is low and sandy, and a reef (awash in places) extends 2 miles off the South point. About a mile off the East side is *Puffin Islet*, about 200 ft. high, within which there is anchorage in 3 to 9 fathoms. *Ainu Bay*, West of the South point, affords anchorage in 8 to 14 fathoms, sand, and here water and driftwood may be had.

Rashau, 15 miles south-westward of Matau, is of oval form, 9 miles in extent N.E. and S.W., and mountainous, its highest peak reaching an elevation of 3,300 ft., in lat. 47° 48′ N., long. 152° 53′ E. On its eastern side is a steaming crater. There is no good anchorage around it, and the steep coast has many rocks lying off it. *Button Rock*, 2 miles off the South point, is low.

Page 739.—**Ushishir.**—The northern island slopes from its North end to an elevation of about 400 feet. The southern island is a volcanic crater, 1,360 ft. high on its western edge, but its southern side is breached, giving access to the sea, and boats can enter by a narrow channel. Within are some boiling springs, and the island is frequented by myriads of seabirds. There is anchorage on either side of the connecting reef, in 8 to 10 fathoms. The North point of the southern island is in lat. 47° 32′ N., long. 152° 42′ E.

Srednoi Strait is 9 miles wide between Rashau and Ushishir, but the most dangerous of all the channels between the islands, a ledge appearing to extend right across it, and the tidal currents rush through it with great velocity. The safest passage is between Rashau and Srednoi Rocks.

Srednoi Rocks lie on a reef about 2½ miles N.E. of Ushishir, and about 2 miles in extent N.N.W. and S.S.E. At its northern extreme is a mass of black rocks about 60 ft. high, a resort of sea-lions and formerly of fur-seal. The southern part of the reef is mostly sunken, but a few small rocks may be seen on its southern end. *Button Rock*, 1½ mile north-eastward of Ushishir, is low, with 11 to 12 fathoms around it.

Ketoy, 14 miles from Ushishir, has several peaks, one rising to an elevation of 3,800 ft. on its N.W. side, and vapour issues from two craters here and in its northern part. The island is about 6 miles in diameter, its centre being in lat. 47° 22′ N., long. 152° 19′ E. The shores are mostly cliffy, and a rocky reef extends nearly 2 miles off the S.E. side. There is anchorage off the North shore in 10 to 12 fathoms; also off the South side, in 12 to 15 fathoms, rocky bottom. There is an easy landing in a bight on the East side of the S.E. point. Sea-lions frequent the S.W., S.E., and East points.

SIMUSHIR, 8 miles S.W. of Ketoy, is 33 miles long, and from 2 to 8 miles wide. *Milne Mountains*, at its S.W. end, rise to two peaks, 5,650 feet high, and on their N.W. side stands a small active volcanic peak. *Prevost Peak* is a beautifully symmetrical

volcanic cone 4,450 ft. high, in lat. 47° 3′ N., long. 151° 57′ E. *Milne Bay*, on the N.E. side of Milne Mountains, affords anchorage in 9 to 10 fathoms, sand, and water may be obtained here. *Broughton Bay* is about 2½ miles in extent, evidently an old crater, with very deep water in it, there being no anchorage till close to the beach; the entrance is less than a cable wide, with 10 to 12 feet water in it. Sea-lions frequent the shores of Simushir, and driftwood is plentiful on the N.W. coast.

Makanruru or *Broughton Island* is about 1½ mile in diameter, rising in a rugged dome 2,900 ft. high, in lat. 46° 43′ N., long. 150° 36′ E. It has inaccessible cliffs, rising over 1,000 ft. in places, and off its N.W. side are some rocks frequented by sea-lions in vast numbers.

Black Brothers are two islands lying 10 miles S.S.E. of Makanruru, still undergoing changes from volcanic activity. *Rebuntsiriboi*, the N.E. island, is 3½ miles in extent, and has three conspicuous conical peaks, the northernmost being 2,360 ft. high, the next 2,170 ft., and the other still lower; the two last emit vapour, and the lowest is occasionally in violent eruption. The reef formerly extending from the North point is now a sandy ridge about 50 ft. high, and in the bay on its South side there is anchorage in 13 fathoms, sand.

Brat Chirnoi, 1⅔ mile S.W. of the other, is about 2½ miles long, and a peak on its western side reaches an elevation of 2,470 feet. Sea-lions frequent a rocky ledge on its N.W. side. Off the N.E. point is a high rock, with a reef extending nearly a mile south-eastward from it.

Page 740.—**URUP STRAIT** is 13 miles wide between Brat Chirnoi and Urup, but is subject to strong tidal currents, and is not recommended in foggy weather, the N.E. end of Urup being so low.

URUP is 58 miles in length, and 8 miles in greatest breadth, rising to a greatest elevation of 4,150 ft. on its N.W. side, about 23 miles from the N.E. end. There are four principal groups of mountains, separated by much lower land, and all on its N.W. side, some of those in the highest group still emitting vapour. *Cape Itoientomo* or *Castricum* is a long narrow flat projection 80 to 100 ft. high, and terminating in a line of bluffy rocks, 2 miles in extent, the outermost being in lat. 46° 15′ N., long. 150° 29′ E. A sunken rock lies about 5 miles S.S.W. of this, breaking only with a high swell. *Cape Nobunots* or *Van der Lind* is now considered to be in long. 149° 24′ E., and has some off-lying rocks around it.

On the N.W. side of Urup are several open bays, affording anchorage, and where wood and water may be obtained. The Japanese fishermen sometimes frequent these bays, of which the principal is that named *Tokotan*, in lat. 45° 52′ N., long. 149° 46′ E., where the depth of 10 fathoms is found about half a mile off shore.

Yetorup Strait is about 20 miles wide, and is sometimes blocked by ice in the spring.

YETORUP, the largest and most important of the Kuriles, is 110 miles in extent, and from 2½ to 20 miles in width, but the chart is still very imperfect. In 1891, the inhabitants numbered 1,343, principally engaged in the fisheries, Furebets being the chief village, and the principal settlements are all on the N.W. coast. The island is mostly mountainous, and attains an elevation of about 5,000 ft. near its central part. Vapour still issues from some of the peaks, and at the N.E. end is a volcano, about 3,800 ft. high, which was in violent eruption in 1883. The Japanese have exported several thousands of tons of sulphur from Moyoro or Bear Bay.

The coasts of Yetorup are bold, with few known off-lying dangers, but there are no sheltered harbours. *Cape Okebets* is now placed in lat. 45° 34′ N., long. 148° 55′ E. *Moyoro* or *Bear Bay*, southward of it, has a fishing settlement. *Shibetoro Bay*, 13 miles westward of the cape, affords anchorage in about 7 fathoms, half a mile N.W. of the village. There is similar anchorage off *Bettobu*, about 28 miles farther south-westward, at the foot of the highest peak of the island (5,040 feet). Off *Shana*, on the south-western side of this peak, the anchorage is bad, and farther south-westward there is anchorage in 5 fathoms, about half a mile off *Rubetsu*.

Furebets is situated on the shore of an open bay, southward of Notoro Point, a depth of 13 fathoms being found about half a mile off. In *Naibo Bay*, farther S.W., there is anchorage in about 7 fathoms, half a mile off the village; in 1904, a breaking rock was reported to lie 3½ miles W.N.W. of the observation spot.

Page 741.—*Roku Bay*, 10 miles N.E. of Cape Tesiko, has anchorage in its N.E. angle, and water may here be obtained from a stream.

Hitokapu Bay, near the middle of the S.E. side of Yetorup, is about 6 miles in diameter, and affords sheltered anchorage in 6 fathoms or less, off the fishing settlements named *Onebets* and *Toshimoi*, on the S.W. and N.E. sides of the bay respectively.

The streams and sea here abound with fish, and whales have been seen here in large numbers.

In about lat. 45° 17′ N. are *Cygnet Rocks*, on the North side of which is a cove, where small vessels find shelter off the village named *Toshiure*, and obtain wood and water.

SHIKOTAN, about 33 miles S. by W. of Cape Tesiko, is about 15 miles in extent N.E. and S.W., by 5 miles in width, rising to an elevation of 1,357 ft. in its N.E. part. The land appears very rugged, but is fairly well wooded, and the numerous streams abound with salmon and trout. In summer, the Japanese collect and dry large quantities of edible seaweed. The coast is indented with small bays and coves, some forming landlocked harbours for small vessels. At *Shikotan Harbour*, at the northern end, is a small Kurile Ainu settlement, where cattle and sheep are kept, and a little cultivation is carried on. Vessels drawing up to 12 ft. would find sheltered anchorage here, in 3½ fathoms. It is high water here, on full and change, at 4h. 30m.; springs rise 4 feet.

Matsugahama Bay, on the southern part of the S.E. coast of Shikotan, is about 2 miles in diameter, with an entrance 2 cables wide between the reefs, and affords anchorage in 6 to 7 fathoms, sheltered from all but S.E. winds.

In 1886, a breaking rock was reported to have been seen from the U.S.S. *Ossipee*, about 5 to 7 miles E.S.E. from the North extreme of Shikotan, but it was not found during the Japanese survey. The weather was foggy and stormy.

Kunashiri Strait is deep and clear, but subject to very heavy tide-rips and overfalls, causing the most stupendous swirls and breakers. From February to May it is often blocked by fields of ice.

KUNASHIRI has not yet been accurately surveyed. It contains about 1,500 permanent inhabitants, largely increased in summer by Japanese fishermen. *Tomari* is the principal village. It has a rocky coast, with no harbours, and is fairly well wooded with fir and other timber.

Atoiya Misaki, or *Cape Moimoto*, the N.E. extreme of Kunashiri, is a high square bluff, joined to the main by a low sandy isthmus, and a dangerous reef, awash in places, extends about 2 miles north-eastward from it.

The LIGHTHOUSE on Atoiya Misaki is a white hexagonal iron tower 52 ft. high, in lat. 44° 26′ N., long. 146° 34′ E., showing a *revolving bright* light every *half-minute*, elevated 217 ft., and visible 21 miles seaward between N. 70° W. and S. 18° W. In foggy weather, a *Siren* sounds a blast of 5 *seconds* at intervals of 1 *minute*.

Keramoi Saki the southern extreme of Kunashiri, is a low narrow tongue of land extending 6 miles southward, and breaking shoals extend south-eastward from it.

The Lighthouse on Keramoi Saki is an octagonal wooden tower 40 ft. high, painted in black and white bands, showing a *flashing bright* light every 15 *seconds*, elevated 45 ft., and visible 12 miles southward between N. 51° E. and N. 7° W. In foggy weather a *Bell* is struck every 5 *seconds*. Lat. 43° 41′ N., long. 145° 32½′ E.

Tomari is connected with Nemoro by a submarine telegraph cable. Other information on Yezo Strait will be given in the Addenda for pages 866-867.

Page 742.—**The SEA of OKHOTSK** only freezes in winter near the coasts, chiefly in the northern part, and the ice is soon broken up by the tides and currents. Ghijinsk Bay freezes to a large extent, but Penjinsk Gulf is usually free from ice throughout the winter. The sea seldom freezes along the West coast of Kamchatka. In March the ice begins to break up, and is carried by the prevailing N.W. gales through the straits between the Kurile Islands into the Pacific, where it meets the cold arctic Oya Siwo current, which carries it southward to the East coast of Yezo.* In June and July there is a general break-up of the ice, and the then prevailing S.E. winds keep it away from the Kuriles. In May enormous fields of ice are often met with between La Perouse Strait and the Kurile Islands.

Page 743.—**The WEST COAST of KAMCHATKA** has not yet been surveyed, and is reported to be charted 10 to 13 miles too far East. In some parts deep water is found near it, and 8 to 10 miles off its southern part, opposite the villages of Javino and Golygino, are some extensive banks abounding with cod, discovered by U.S. fishermen in 1860; the fish appear on them about the middle of June, and are taken in large numbers and dried on shore.

Kambalnaia River runs into the bay northward of Cape Lopatka, which is frequented by whales in August and September. The pearl-mussel is found in *Golygina River*, farther northward.

* On March 18th, 1900, the steamer *Ness* was damaged by getting among immense fields of floating ice in lat. 42° 36′ N., long. 146° 18′ E., only a few miles from the eastern point of Yezo.

Bolschaia or Kyschka River serves as a winter route to Petropaulovsk and Kamchatka River. Its entrance forms a narrow deep inlet, affording shelter to small vessels. *Bolcheretsk*, first settled in 1711, is now a miserable little village, though the land around is fit for cultivation, and horses and cattle can be reared. The river abounds with fish, but its entrance freezes up between October 28 and November 11, the date of opening varying between March 23 and May 4.

Worowskaia River debouches in about lat. 54° 25′ N., at the southern end of the long narrow inlet known as *Tschkanygitsch Bay*, which has depths of 2 to 6 fathoms, where small vessels have safely wintered. Graphite has been found up this river.

Oblukowina River debouches in about lat. 55° 17′ N., and has a small village on its left bank, about 10 miles from the sea. Gold has been found in its upper part, whence there are trails to the valley of Kamchatka River.

Itschinskaia River has the village of *Itsha* about 10 miles up. About 53 miles farther to N.N.E. is the mouth of *Moroschetsnaia River*, within which rises the Moroschets volcano.

Page 744.—*Cape Utkoloksi* has some rocks and islets off it, and might be mistaken for Cape Omgon in approaching from the West.

TIGEL RIVER has a course of about 100 miles, and at low water its entrance is about 120 yards wide, with 3 ft. over the outer bar, and the tide rises from 16 to 20 feet. *Fort Tigel* is the chief centre of commerce on the West coast of Kamchatka, and supplies of beef, fish, milk, and potatoes can be had here. The bar beacons in line are stated to bear S.E. by S. The river freezes up at the end of October, the opening varying between May 4 and June 2.

In 1904, the U. S. steamer *Mineola* was wrecked on an isolated rocky shoal, about 8 miles N.W. by N. from the mouth of Tigel River. It was examined by the officers of H.M.S. *Algerine*, and found to be about 1½ mile long, E. by N. and W. by S., and three-quarters of a mile wide, with 3 to 6 fathoms over it, and 12 fathoms between it and the river bar, gradually decreasing to 5 fathoms about 2 miles off the latter.

Liessnaia River debouches in about lat. 59° 23′ N., and forms the boundary between the Petropaulovsk (or Kamchatka) and Gishiginsk districts.

Coast Districts.—Between the Liessnaia and Uda Rivers, the northern and western coasts of the Sea of Okhotsk are divided into the political districts of *Gishiga*, *Okhotsk*, and *Uda*, the seats of government being at Gishiga, Okhotsk, and Nicolaievsk respectively. Some deposits of coal have been found on the coast, near the mouth of Kolkatshujem River, about 10 miles north-eastward of the Liessnaia, and gold, graphite, and other minerals are reported in various places.

Penjinsk Gulf shoals irregularly towards the mouths of the rivers running into it, and schooners reach the village of *Kamenskoje*, at the entrance of *Penshina River*, which runs into the N.E. angle of the head of the gulf. On the *Oklan*, a tributary of this river, much timber was obtained in 1868, for the use of the proposed telegraph line, afterwards abandoned. The gulf usually remains clear of ice in winter, but the rivers are frozen up till the middle of June.

Gishiga Bay is more frequented than Penjinsk Gulf. Its shores are fronted by rocks and islets, and the tidal streams run 1½ to 2 knots an hour. The three islands off *Cape Khalpih* are named *Khalpih Islands; Morskaia Matuga* lies 8 miles farther north-eastward, and 4 miles farther on is *Glinyanni Island*. A sunken rock is said to lie 8¾ miles to the westward of Morskaia Matuga, and another about 4 miles N.W. of Glinyanni.

Page 745.—**Gishiga River** is navigable by boats for about 40 miles, but large vessels must anchor 10 miles off. The village on the East side of the entrance is named *Kuschka*; no *light* is now shown here. At the census in 1897, *Fort Gishiga* had 435 inhabitants living amid very dreary swampy surroundings, 25 miles up the river; it is in about long. 160° 45′ E. From May to September S.W. and westerly winds prevail here, and northerly and N.E. winds during the remainder of the year.

Tawatoma River runs into the western side of Gishiga Bay, in about long. 158° 15′ E., and has good anchorage off its mouth. It abounds with fish and has forests of larch and poplar on its banks, but is usually frozen up from the end of November to the middle or latter part of May. About 30 miles south-westward of this is the mouth of *Wiliga River*, which forms the boundary between the political districts of Gishiga and Okhotsk.

Jamsk is unhealthily situated on the landlocked shallow bay at the S.W. extreme of Ghijinsk Gulf, at the mouth of the *River Jama*. It was formerly well populated, but has decreased under Russian domination, and in 1897 the inhabitants numbered only 233. Some of them are good smiths and carpenters, building good boats (baidar), carrying up to 100 poods (about 1⅔ ton).

Between Jamsk and Tauisk Bays is a mountainous peninsula, said to be rich in minerals. It is subject to earthquakes, and we have little or no information beyond what is shown on the chart. In about long. 152° 10′ E. is *Ssiglan* or *Zabiyaka Bay*, which affords anchorage in 6 to 7 fathoms, eastward of the West point of the entrance, but it is shallow farther in.

TAUISK BAY is an extensive gulf, with several large rivers running into it, but we have little information concerning it. It freezes up about the end of October, and becomes clear of ice at the beginning of March, though the rivers remain frozen till May or June. On the eastern side of the entrance is *Olskii Island*, which has a spring of fresh water on its northern side.

At the head of *Odshan Bay*, the eastern angle of Tauisk Bay, clouds of steam will be seen rising from the spontaneous combustion of deposits of limestone and brown coal.

Ola or Kola River runs into the N.E. angle of Tauisk Bay, the East point of the entrance being in lat. 59° 33′ 25″ N., long. 151° 15′ 16″ E. There is anchorage in 5 to 6 fathoms, sand and mud, about 1½ mile off it. It is high water here, on full and change, at about 8h. 45m.; springs rise 10 to 12 feet. Coasters up to 10 tons burden can enter the river, and reach the village of *Ola*, about 1 mile within, a place with considerable trade, but the inhabitants only numbered 116 in 1897. Vegetables and potatoes are grown here.

Arman River debouches in about long. 149° 50′ E., and boats can ascend it for about 20 miles. About 18 miles farther westward is the mouth of *Jana River*, with the village of *Tauisk* at its entrance; about 50 miles up it coal deposits have been found, and remains of the mammoth.

Kawa or *Kova River* debouches in the N.W. angle of Tauisk Bay, southward of Tauisk, and is one of the largest rivers of this region, having a course of about 150 miles. It abounds with fish, and its forests yield good timber, and the natives chase bear, fox, etc., for their fur.

The Coast between Tauisk Bay and the River Inja, a distance of about 140 miles is low and sandy, with occasional woods of larch and birch. It is not permanently inhabited, but is visited by the Tungus tribes for supplies of fish and seal-oil. There is but little information concerning it.

Inja River debouches in about long. 145° E., after a course of upwards of 150 miles. About 1 mile up it is the village of *Inskoje*, situated amid woods, and land fit for cultivation. In 1897, the inhabitants numbered only 132, but it was formerly of more importance, and visited by the American whalers. The river is frozen up from December to the end of May.

Eastward of Inskoje is a high cape, the western point of *Schilki Bay*, within which are two volcanic peaks. Hence to Okhotsk, the coast appears low, and along it are the shallow mouths of several rivers.

Pages 745-746.—**OKHOTSK** is the seat of government of the province of the same name, but only contained 304 inhabitants at the census in 1897. There is no fresh water in the neighbourhood, and the river is salt here. The harbour is free from ice from June to October, but the bar only has depths varying from 8 to 15 ft. at high water, or 4 ft. at low water. Two movable beacons in line lead into it. There is anchorage 1½ or 2 miles off.

Okhota River has a course of about 300 miles, and forms a low delta at its mouth, all overflowed in the early summer. Deposits of coal and gold have been found up the *River Kuchtui*.

During 9 years observations, the prevailing winds from September to March were northerly, with clear weather; from May to August East and S.E. winds prevail, with much rain and fog. West and S.W. winds are rare. The average annual rainfall is 12¼ inches, chiefly falling from June to September. Snow first appears about the middle of October. The temperature varied between extremes of 77° F. in July, and 50° below zero in February.

The sea never freezes near Okhotsk, but drift-ice sometimes appears between December and April. The ice leaves the river in June, when the prevailing winds force it against the coast.

Page 746.—**The West Coast** of the Sea of Okhotsk consists of a succession of dreary dark rocky cliffs, and only a few dwarf cedars and birch trees are to be seen. Numerous rivers and streams debouch along it. Along its whole extent, between Okhotsk and Uda River, the only settlements are at Port Aian and on the Uda.

Ulja River entrance is in about lat. 58° 58′ N., and is about 200 yards wide, with a depth of 10 ft. in it at low water. The river has a course of about 300 miles, through

a well wooded valley, and is navigable for about 130 miles. At 40 miles up it are some hot springs, frequented by water-fowl.

Aldoma Bay mostly dries at low water in its inner part, and a large river runs into its head, but is not navigable. In summer it is frequented by fishermen, and the Americans once had a factory here.

Malminsky Islands, 10 miles south-westward of Aldoma Bay, are a group of bare rocky islets.

PORT AIAN is of little or no commercial importance, and the settlement formed here by the Americans in 1847 is now in ruins. The stream near it disappears among the stones in summer. The outer coast of the peninsula forming the bay consists of white cliffs above which a peak rises to an elevation of about 1,200 feet.

Page 747.—**St. Jona Island** appears to be of volcanic formation, and some fur-seal have been taken on it. In 1896, a rock was reported to lie 9½ miles S. by E. ¼ E. from it, whether above or below the surface not stated.

Pages 747-748.—**SHANTAR ISLANDS** are visited by fur-seal, but they are reserved for the Russian Company. *Great Shantar* is mountainous and wooded, and is visited by native hunters for the fur of the bear, fox, and sable; its North point is in about lat. 55° 13′ N., long. 137° 30′ E., and its South point in lat. 54° 38′ N. *Prokofieff Island* is now considered to lie in long. 138° 17′ E., and *Koassoff* in 138° 2′ E.

The currents run 3 to 4 knots among and around these islands, but off the South point of Great Shantar they are said to run 7 knots.

Page 748.—**Uda Gulf**, or *Oudsky Bay*, has moderate depths of water, with muddy shores. *Uda River* entrance is in about long. 135° 10′ E., fronted by wide mud-flats, and on its southern side is the settlement, named *Tschumikan*, in a low swampy position; it was removed from Fort Ouda. The river has a course of about 450 miles, through wooded country, but is usually only accessible to small boats, and is frozen up from November to May. At high water, there is a depth of 10 or 12 feet in the entrance. Violent gales from S.W. and W.S.W. are prevalent here.

Tugur Gulf, or *Tugursk Bay*, is fronted by the Shantar Islands, and is usually blocked by ice till the end of June. Its shores are low and swampy, fronted by wide drying flats, which reach about 2 miles off Tugur River entrance, and backed by rocky hills. *Tugur River* flows through a wooded valley, but has only 1 to 3 ft. water over its bar; a whale fishery was once carried on here. On the East side of the gulf is *Ujambin Bay*, affording good anchorage off the low sandy isthmus separating it from Constantine Bay.

Ulban Gulf, or *Oulbanski Bay*, also has low muddy shores, and *Constantine Bay* is now reported to have silted up.

SAGHALIN GULF, westward of the North end of the large island of that name, has moderate depths of water. Its inner part is usually frozen over from the middle of November to the end of April, but with a continuance of northerly winds, drift-ice may remain here till July.

Pages 748-750.—**SAGHALIN, Sakhalin, or Karafuto** (Japanese), has an area of about 30,000 square miles. Its mountain chains are of slate, cretaceous, and sandstone formations, there being no sign of volcanic action here. In 1905, after the conclusion of the disastrous war with Japan, the Russian government ceded to the latter power the southern half of the island, the parallel of 50° being the boundary. The population is now estimated to number about 30,000, the Ghiliaks numbering about 2,000, the Aïnos 1,300, and Orotchones 800, the latter living along the Poronai River and on the East coast. The remainder consisted of Russian convicts and their military guard, the Russian governor residing at Alexandrovsk. Korsakovsk, the other convict settlement, is now in Japanese territory, and by them named Kushunkotan.*

The trade is practically in the hands of the Japanese, who export considerable quantities of timber, salted salmon, fish oil and manure, edible seaweed, and fur of the sable, seal, bear, fox, &c. Wolves, squirrels, and reindeer are also found. The inclement climate will only permit the growth of rye, vegetables, and potatoes in the southern part, the shortness of the summer rendering cultivation very precarious in the northern parts.

On the lower slopes of the mountains are forests of fir and larch, birch, maple, and mountain ash, and on the plains near the rivers are woods of walnut, oak, elm, and prairies of tall grass. In the southern parts may be found dwarf bamboo, cork, and

* An interesting account of a recent visit to Saghalin will be found in "In the Uttermost East," by C. H. Hawes, 1903.

other sub-tropical growth. Petroleum has been found at the North end of the island, and on its N.E. side, but has hitherto not been worked.

The climate, owing to the cold currents by which Saghalin is surrounded, is similar to that experienced in much higher latitudes, its flora resembling that of Spitzbergen. The East coast is often impeded by ice until July.

Page 751.—**Cape Golovatcheff** is now placed in long. 141° 47′ 30″ E. *See Addenda for page* 766.

Cape Lowenstern is now placed in lat. 54° 7′ N., long. 143° 13′ E., and *Cape Klokatcheff* in lat. 53° 42′ N.

In about lat. 52° 50′ N. is the mouth of the *River Nutovo*, which runs into a shallow lagoon, which thence extends southward to beyond the entrance of the River Tymy, the outer line of sandhills being broken by three narrow straits. In the vicinity of the Nutovo petroleum and bituminous deposits have been found, the oil being of good quality and stated to exist in great quantities.

Anuchena Harbour, in lat. 51° 58′ N., is the shallow outlet of the *River Tymy*, and northward of it the coast is fronted by shoals extending 4 or 5 miles off. The bar is said to have about 2 fathoms over it, and small vessels can cross it and find anchorage in about 3 fathoms, within the South point.

Cape Ratmanoff is in about lat. 50° 52′ N. *Mount Tiara* is only 1,940 ft. high. *Cape Bellingshausen* is now placed in lat. 49° 33′ N., long. 144° 22′ E.; in 1906, the Japanese authorities announced that hence to the parallel of 50° N. the coast is very incorrectly delineated on the chart, and has reefs and off-lying rocks.

Page 752.—*Nizmennoi* or *Flat Bay*, in lat. 49° 7′ N., appears to be of small extent. About 7 miles S.E. of it is *Bratkovsk Point*, marked by a *beacon*; between this and Cape Povorotni are three off-lying islets.

Cape Patience, *Terpenia*, or *Kataoka*, East extreme, was found by the officers of H.M.S. *Peacock*, in 1893, to be in lat. 48° 42′ N., long. 144° 55′ 30″ E. Temporary anchorage may be found in 6 fathoms, about half a mile northward of it, westward of the sunken reef extending from it. A reef extends about 5 miles south-westward from its West extreme, and there are some dangerous sunken rocks between this and Robben Island, where the tide runs 3 knots at springs.

Robben Island, or *Tiuleni*, lies 11½ miles S.W. ½ S. from Cape Patience, and is a flat-topped islet about 700 yards in extent, and 40 to 50 ft. high, in lat. 48° 31′ 30″ N., long. 144° 45′ E. It has no fresh water, and is the resort of sea-birds and fur-seal; the Russian Company's station for dealing with the latter, from May to November, was near the S.W. end. There is no good anchorage around it, and vessels must put to sea in bad weather. Rocky reefs extend northward and south-westward from it, and when H.M.S. *Redpole* was here in 1898, ice extended about 1½ mile off. There is anchorage off the S.W. side, in 13 fathoms, sand, with the rock (10 ft. high) on the end of the northern reef bearing E.N.E., and the end of the southern reef S. by E. ½ E.; the bottom is rocky nearer in. Capt. J. Sandman says there is anchorage anywhere N.W. of the island, in 10 to 20 fathoms; there is 13 fathoms, sand, at 1 mile N.W. ½ W. from the centre, the bottom being rocky closer in.

In 1903, H.M.S. *Fearless* found a patch of 7½ to 8 fathoms, at 5¾ miles S. ⅓ E. from the island.

Extreme caution must be used when in this region, especially at night or in foggy weather, as other dangers probably exist besides those shown on the chart.

PATIENCE BAY, or Shichiro or Chitose-wan, has moderate depths. On the western coast, in about lat. 49° 6′ N., was the Russian settlement named *Nai-ero*, with telegraphic communication, and there is anchorage off it, on sandy ground. *Poronai* or *Ny River* is navigable by small boats for about 40 miles.

In about lat 47° 55′ N. is a settlement named *Manoue*. *Mount Lopatinsky* is about 3,900 ft. high. *Cape Seniavine* is in about lat. 47° 23′ N., long. 142° 55′ E.

Morlovinov Bay.—On the western side is the entrance to a large lagoon, barred by a rocky reef, at half a mile off which anchorage was found in 6 fathoms. *Cape Tonin* should not be approached within 1 mile.

Page 753.—*Cape Leveron* is now placed in lat. 46° 21′ N.

ANIWA BAY, or Higashi-Fushimi-wan, like other parts of this region, must navigated with caution, as the chart is far from perfect.

Pages 753-754.—**CAPE NOTORO, Krilon, or Kondo-misaki Lighthouse** is an octagonal red brick tower 39 ft. high, in lat. 45° 53′ 10″ N., long. 142° 4′ 51″ E., and near it is a mast, on which Code signals may be shown to passing vessels. The sector of *red* light over Kamen Opasnosti is shown between S.E. ¼ E. and S.E. by S. ½ S. In foggy weather, a *Siren* will sound a blast of 5 *seconds* with silent intervals of 100 *seconds*;

if out of order, a *Bell* will be struck *ten* times every *minute*. There is a telegraph cable to Cape Soya.

Page 754.—**Kamen Opasnosti,** *Nijogan*, or *Dangerous Rock*.—In 1905, the officers of the Japanese vessel *Musashi* found this rock to lie 6 cables N.N.W. from its charted position; and, in 1906, it appeared to extend more than 2 miles farther S.E. than charted. A *bell buoy*, *red* and *white bands*, was placed about 9 cables E. ¾ S. from it, but it was shortly after reported to have been washed away.

Vennotchi Point, 9 miles northward of Tsisia Point, has rocks extending nearly 2 miles off it. *Lososei Bay* is known to the Japanese as *Tsu-shima-wan*.

KORSAKOVSK, now **Kushunkotan**, was a Russian penal settlement, where supplies of fresh beef, other provisions, and coal could be obtained. It is connected with Cape Notoro by a telegraph cable. The coast here is moderately high, with white cliffs, and a conspicuous white hill northward of the village; the white roofs of the houses and the windmills also form good marks. Large vessels are advised not to anchor in less than 7½ fathoms, mud and sand. There are several rocky patches of 12 to 20 ft. in the vicinity. Westerly and southerly winds send in a heavy sea. There is a small pier for boats.

Light.—A *fixed bright* light, elevated 201 ft. and visible 8 miles seaward between N.W. and S.E. by S. ¼ S., is shown from a staff on the white hill.

Winds, &c.—Observations extending over 9 years show that easterly and S.E. winds are infrequent here. After the middle of July, stormy S.W. and westerly winds are experienced. The temperature ranged between extremes of 80° F. in July and 17° below zero in January and February. The average annual rainfall is about 20 inches, chiefly from April to October. Fog is always prevalent in Aniwa Bay, and is almost continuous in June and July. The bay is said to be free of ice all the year.

Enduma Point, southward of Korsakovsk, is reported to be incorrectly charted with respect to its direction from Cape Notoro. In 1906, Capt. J. R. Mathieson, barque *Antiope*, reported a 20½-ft. gravel shoal at 9½ cables S.W. of the point, and it was temporarily marked by a *buoy*.

Page 755.—**LA PEROUSE or SOYA STRAIT.**—In 1896, a depth of 12 fathoms was reported at about 38 miles E. by S. from Cape Notoro. The strait is said to be kept clear of ice by the warm current from the Sea of Japan, but in the winter of 1904-5 the steamer *Tellus* was badly damaged here by ice. In winter the sea freezes for 6 to 8 miles off the northern shores of Yezo.

Rebun-to or *Refunsiri Island* rises to an elevation of 1,611 ft., its western coast being cliffy. It is under cultivation and populous, and connected with Risiri by a telegraph cable. Reefs extend from the N.W. point to *Todo-jima* or *Bomasiri Islet*, from which reefs and foul ground extend about 3 miles northward. *Todo-sho* or *Bittern Rock* has 1 foot water over it, and a 3¼-fathoms patch is said to lie 1½ mile N.E. of it. *Funotamari Bay*, within these reefs, affords anchorage in 4 to 10 fathoms.

Kabuka is a large village on the eastern side of Rebun-to, and at about 3 cables off it there is anchorage in 8 to 9 fathoms, sand, sheltered from the prevalent westerly gales of autumn. There is telegraphic communication.

Barrick Rock has been carefully sought for by Japanese officers, and is considered not to exist.

Risiri Island is about 10 miles in diameter, and rises to an elevation of 5,637 ft., being a volcanic cone with wooded slopes. The island is partly cultivated, and supplies of fish, fowls, vegetables, and water can be obtained at the villages of Oshidomari and Oniwaki, with which there is steamer and submarine telegraphic communication. Edible seaweed is exported in large quantities.

Oshidomari or *Nakko Bay* affords shelter from westerly gales; the best anchorage is in 7 fathoms, nearly 3 cables S.S.E. of the lighthouse, but small steamers go farther in. It is high water here, on full and change, at 4h. 56m.; springs rise 1 foot.

Light.—On Beshi-zaki, the N.W. point of Oshidomari Bay, stands a white stone turret 15 ft. high, showing a *flashing bright* light every 15 *seconds*, elevated 238 ft., and visible 14 miles seaward between N. 33° W. and S. 60° E.

Oniwaki is on the S.E. coast of Risiri, and there is anchorage 2½ cables off it, in 7 to 8 fathoms, sand. A telegraph cable connects it with the coast of Yezo.

Page 756.—**Totomosiri** or *Todo-shima* is connected with Wakkanai by a telegraph cable, and by another with Alexandrovsk.

CAPE NOSSYAB, Nosshaf, or *Nosshar*, is 717 ft. high. The village here is named *Wakkanai*, and has regular steam communication with Otaru.

The Lighthouse on Wakkanai Point is a red tower 34 ft. high, in lat. 45° 26′ 30″ N., long. 141° 38′ 40″ E., showing a *double-flashing bright* light, thus:—flash, interval 5

seconds, flash, interval 15 *seconds*; it is elevated 138 feet, and visible 18 miles seaward between S. 27° W. and S. 44° E. In foggy weather, a *Siren* sounds *two* blasts of 2 *seconds* every 2 *minutes*, thus:—low blast, silent 4 seconds, high blast, silent 112 seconds.

CAPE SOYA is 190 ft. high, and the white rock westward of it is 38 ft. high. In 1906, the Japanese surveyors found a detached 3-fathoms rock at 11 cables E. ½ S. from the lighthouse on it. The reef reported to lie 7 or 8 miles E.S.E of the cape has been carefully searched for without success, and has been removed from the chart. In 1902, the steamer *Hidaka Maru* was reported to have struck on a sunken rock lying about 20 miles S.E. by E. from the cape. In 1905, Capt. R. J. Gordon, steamer *Vennachar*, reported that he struck on a pinnacle rock with about 8 ft. water over it, lying nearly 1 mile off shore, at 14 miles south-eastward of Cape Soya.

In 1906, the Japanese surveyors found a bank with 12 fathoms least water over it, at 14½ miles E. ⅞ S. from Cape Soya lighthouse; the overfalls on it gave it the appearance of much shoaler water.

The Lighthouse on Cape Soya is an octagonal iron tower, 54 ft. high, painted in black and white bands, showing a *flashing bright* light every *half-minute*, elevated 132 ft., and visible 17 miles seaward between S. 84° W. and S. 67° E. In foggy weather, a *Bell* is struck *twelve* times every *minute*.

Romanzov Bay, or *Soya-wan.*—Several shallow patches have been found in this bay, as shown on the chart. The outermost is a rock with 3 ft. water over it, with 10 to 12 ft. around, on which the steamer *Teshio Maru* struck in 1904, about 5 miles E. by N. ½ N. from Wakkanai lighthouse.

Observations made at *Soya* during 12 years show that strong southerly winds prevail in summer and northerly winds in winter. Dull weather prevails, but fog is not so bad here as on the West coast of Yezo. In winter, the sea may freeze for several miles off with easterly winds, but a westerly wind will quickly remove it.

With the flood stream, the easterly current off Cape Soya runs 2½ to 4 miles an hour; and a heavy sea is usually met with in the strait.

Petroleum exists in this region, and at Nukimi mura it flows into the sea, rendering it always smooth.

Page 758.—**Soni Bay,** 10 miles northward of Cape Notoro, affords anchorage with off-shore winds, but the coast is fronted by rocks. *Nevelskoi Bay* is now known as *Rakumaka* or *Takmaka*, and rarely freezes.

Mauka Cove affords safe anchorage during N.W. winds, but the bottom is rocky; the tides are weak, but sometimes rise 2 feet.

Page 759.—**Kosounai** or *Kosuna.*—There is open anchorage in 6 fathoms, sand, about 7 cables off shore; the beacons no longer exist. In summer, strong winds are prevalent, especially from S.S.W.; the sea does not freeze here in winter.

Raitsiska or *Rudanovskago River* is brackish.

A sunken rock is reported to lie about 1 mile off *Cape Gavrilova*, in lat. 49° 10′ N.; and 4 miles farther northward a shoal of 2 to 3 fathoms was reported, in 1906, to lie about 1½ mile off the low swampy shore of *Lesovskago Bay*.

Korsakova Bay is in about lat. 50° 3′ N., within the Russian boundary (50° N.). In 1906, a drying reef was reported to extend about 3 cables off shore, at 6 cables southward of Pilevo River entrance.

Page 760.—**DUI or Due Light** and fog signal are discontinued, and the buoys cannot be depended on; in 1905, a *bell buoy* was placed 2 miles W. ¾ S. from Cape Jonquière (Otsisi), but in May, 1907, it did not exist.

The coal-mines now worked are at Due and Vladimirsk, the latter about 12 miles north-eastward. The product, about 40,000 tons per annum, is a good lignite, superior to Japanese, and was supplied at about 6 roubles per ton. Loading, however, is very tedious, the anchorages being open and exposed. It has been proposed to construct a mole over the rocks extending from Cape Jonquière.

CAPE JONQUIERE Lighthouse is a white dwelling surmounted by a tower, 39 ft. high, half a mile southward of the point. It exhibits a *flashing bright* light every *half-minute*, elevated 241 ft., and visible 23 miles seaward between S. 37° W. and N. 1° W., being obscured over the reef extending off Cape Hoidji or Khodzhi. In foggy weather, a *Bell* sounds *twice* at intervals not exceeding 3 *minutes*, and a *Gun* will be fired at intervals of 5 to 10 minutes in answer to a gun fired at sea. The light and fog signal are only in operation while navigation is open.

ALEXANDROVSKI, north-eastward of Cape Jonquière, is a town of about 6,000 inhabitants, mostly convicts, and is the seat of the governor of Russian Saghalin. It is situated at the foot of the mountains, the land between it and the sea being marshy.

There is a pier 350 yards long at the mouth of the river, 1 mile from the town, with which it is connected by a tramway. From May to November steamers call here regularly, but in winter communication with the mainland is only maintained with difficulty by dog-sledge over the ice to Nikolaevsk in January and February.

In summer, a maximum temperature of 81° F. has been registered in July, and a minimum of 38° below zero in January. Snow begins to fall in October, and for nearly 6 months the country is covered with it for a depth of 1 to 3 feet.

The 3-fathoms line reaches about 6 cables off shore, and in 1905 a rocky patch of 5¼ fathoms was reported to lie 10¾ cables N. 13° W. from the end of the pier.

Page 761.—In 1905, a rock with less than 9 ft. over it was reported to lie about 1½ mile off shore, at 4 miles S. 13° W. from *Uandhi Point.*

The West Coast of the Gulf of Tartary is reported to be very inaccurately charted, according to observations made by officers of H.M.S. *Impérieuse* and those of the Russian corvette *Rynda.*

Cape Disappointment is reported to be charted 8 miles too far East. The three peaks over it are about 2,500 ft. high.

Svyetlaya River, in lat. 46° 30′ N., has 7 ft. water in its entrance, and has anchorage 3 cables off it, in 6 to 9 fathoms, with off-shore winds. In lat. 46° 40′ is *Plitnyak Bay*, and in 46° 54′ is the mouth of *Toropuichina River*, with similar anchorage, in 6 fathoms. *Ademi River*, south-westward of Cape Suffrein, has anchorage in 6 fathoms, 3½ cables southward of it, sheltered from northerly and westerly winds.

Cape Suffrein is reported to be in lat. 47° 13′ 30″ N. There is temporary anchorage off *Luda* and *Nelma Rivers*, in lat. 47° 28′ and 47° 38′ respectively. There is also anchorage for small craft off *Koppi River* and in *St. Innocentia Bay*, in lat. 48° 33′ and 48° 37′ respectively.

ST. NIKOLAYA POINT, or Beachy Head.—The Lighthouse is a white dwelling surmounted by a tower, 45 ft. high, showing a *double-flashing bright* light every *half-minute, two* flashes of 2 seconds each in 8 seconds, and then eclipsed 22 seconds; it is elevated 258 ft., and visible 22 miles seaward between N.N.W. and S. by E. In foggy weather, a *Siren* sounds a blast of 7 *seconds*, at intervals of 1 to 2 minutes; if not available, a *Bell* will be sounded *twice* at intervals not exceeding 3 *minutes*, and a *Gun* fired at intervals of 5 to 10 minutes in answer to guns at sea.

Pages 761-762.—**BARRACOUTA BAY**, or *Port Imperatorskaya*, is frozen over during the winter or from November to April. On *Menschikova* or *Normandy Point*, on the North side of the entrance, stands a square white wooden *beacon*, at an elevation of 60 ft. above the sea. H.M.S. *Alacrity* found a depth of 3 fathoms at the head of the southern bay, in place of 5 fathoms shown on the chart.

Page 762.—**Vanina Bay**, close northward of Barracouta Harbour, is an inlet with 7 to 8 fathoms in the entrance, and 4 to 5 fathoms farther in.

Page 763.—**Mosolova Bay**, sheltered by *Cape Duga* and the islands off it, has depths of 7 to 8 fathoms in the entrance, and 4 to 5 fathoms farther in.

CASTRIES or KASTRI BAY has regular steam communication while navigation is open, but only with Nikolaevsk by dog-sledge in winter. Vessels above 14 ft. draught cannot enter the Amur River. A small quantity of Due coal is usually stored on Observatory Island. In summer south-easterly winds prevail here, and dense fogs are frequent. The *buoys* or *beacons* marking the dangers cannot be depended on.

Kloster-camp Point Lighthouse, standing on the hill about 400 yards within the point, is a brown brick tower above a dwelling, 39 ft. high, now showing a *triple-flashing bright* light every 20 *seconds*, *three* flashes of 2 seconds each in 8 seconds, followed by an eclipse of 12 seconds; it is elevated 260 ft., and visible 22 miles seaward between N. 62° W. and S. 21° W. In foggy weather, a *Bell* is sounded *twice* at intervals of not more than 3 *minutes*, and a *Gun* is fired at intervals of 5 to 10 *minutes* in answer to guns at sea.

Vostok Bank has 12 ft. water over it.

Page 764.—The *beacons* on *Klikoff Point* are about 400 yards apart, and in line bear N. 65° W. At night, a *fixed bright light* is shown on each beacon, visible 14 and 8 miles respectively.

The *telegraph cable* to Saghalin passes northward of Basalt Island and Vostok Bank, spar buoys marking its route S.E. of the former.

Observations in 1898 made the time of high water, on full and change, to be 11h. 45m., and the rise 7 feet.

Page 764.—**The GULF of AMUR, or Straits of Tartary,** has a least depth of 17 or 18 ft. in the fairway, between the Gulf of Tartary and Saghalin Gulf, and in places depths of 8 to 14 fathoms will be found. The channel was marked by buoys and beacons, but its navigation would be very risky without the aid of local knowledge. The water is nearly fresh, and from November to May it is frozen up. There are but few settlements along its desolate shores.

Pilots are to be had at Castries Bay or Vladivostok, but it is stated they are not qualified to take entire charge of a vessel, being only capable of pointing out the best route.

In approaching the Gulf of Amur from the North, anchorage may be found in 4 to 8 fathoms, about 6 miles westward of *Cape Golovatcheff*, or in a more sheltered position off the fishing villages of *Tamle-vo* or *Muzma* southward of it. A beacon tower, 42 ft. high, stands on *Langre Island*, on the opposite side of the strait, and north-westward of this is the extensive lagoon known as *Stchiastia Gulf*, on the North side of which is the village of *Petrovski*.

Pages 765-766.—**The AMUR RIVER** is not accessible to vessels drawing over 14 ft., and deeper vessels must be lightened to that draught at Vladivostok or Castries Bay. Its importance as a trade route has been greatly diminished by the completion of the Trans-Siberian railway from Russia to Vladivostok and Port Arthur. The river is navigable for ordinary vessels as far as *Khabarovsk*, about 500 miles above *Nikolaevsk*, on a branch of the railway; thence to *Blagovestchensk*, about 600 miles farther up, it will only admit vessels up to about 5 ft. draught, and they may also reach *Pokrovska*, about 550 miles farther, except when the river is low in June and July. Hence to *Stretensk*, 250 miles farther, a depth of only 2 ft. is found in places when the river is low.

Page 766.—**Nikolaevsk** is decreasing in importance.

Tidal Signals were made, by day and night, at the signal stations on Capes Djaoré Prongé, to indicate the depth over the bar.

Page 767.—**The COAST of RUSSIAN TARTARY,** forming the southern part of the Russian Maritime Province or Coast District, still remains of but little commercial importance, notwithstanding the completion of railway communication with Vladivostok, and the charts are stated to be inaccurate in many parts. The natives are of the Tungus stock. There is but little cultivation near the coast, though the soil is said to be good. Cattle, sheep, etc., are kept by the few settlers, but fish forms their principal means of support. There are deposits of coal around Novgorod and Ussuri Bays, but it is not worked; iron-ore also exists.

The Climate is fairly good, though very cold in winter, when the harbours, bays, and rivers are blocked by ice from December to March. In summer, or from June to August, southerly and S.E. winds prevail, bringing fog and rain. In winter, or from October to March, northerly and N.W. winds are prevalent. In April, May, and September the winds are variable.

Uniform System of Buoyage.—See Addenda for page 725.

The Coast between Tumen Ula River and Butakov Point, a distance of 10 miles, is low and marshy, but thence northward is steep and rocky.

Furugelma Island has steep and rocky shores, and is covered with grass. At 3 cables off the S.W. point is a rock usually visible; a 3½-fathoms patch lies off the N.W. point, and midway between this and the mainland are *Baleine* or *Mikhelson Rocks*, about 6 ft. high. *Bui* or *Buoy Rock* lies about 3 cables off the eastern end.

POSIETTE BAY is about 15½ miles wide between Cape Gamova and *Suslov Point*, the southern extreme of Bodisko Peninsula, and within this line extends 19 miles north-westward. Pallada Road is usually free from ice in winter, but Novgorod and Expedition Bays are frozen over for about 4 months. Posiette Bay is much subject to fog, especially in June and July.

Light.—On *Cape Gamova* stands a lighthouse 48 ft. high, in lat. 42° 33½′ N., long. 131° 12¼′ E. It shows a quick *double-flashing bright* light every 10 *seconds*, elevated 210 ft., and visible 16 miles. In foggy weather, a *Siren* sounds a blast of 4 *seconds* every *minute*, and a *Bell* is also used.

Page 768.—**Pallada Road** is only recommended as a temporary anchorage; the S.E. winds of summer send in a heavy swell. *Klikova* or *Yedo Rock* has only 7 ft. water over it, and is marked by *spar buoys* in summer; its position is also pointed out by two pairs of *beacons*, on Deger and Gekel Points.

Expedition Bay.—The entrance is less than a cable in width, with a depth of 7 fathoms, between *Cherkavskago Rock* 50 ft. high, on the East, and the shoal extending off *Churkhado* or *Nazimof Point* (92 ft. high) on the West.

Light.—On Nazimof Point stands a white iron tower, showing a *fixed* light, elevated 62 ft. and visible 13 miles; the light is *red* over the N.E. side of Posiette Bay and Yedo Rock, and *bright* southward of S. 41° E.

To enter Expedition Bay, steer about North to pass between Cherkavskago and the buoy marking the shoal on the western side, and when 3 to 6 cables within anchor in 6 to 8 fathoms off *Postova Bay*. Vessels of moderate draught can go farther in.

Novgorod is a Russian military settlement around Postova Bay, the observation spot being in lat. 42° 39′ 25″ N., long. 130° 49′ 15″ E. It is connected with the telegraph system, and provisions may be obtained here, but water is rather scarce. Maize, sweet potatoes, etc., are grown hereabout. There are no coal-mines in this region.

Novgorod Bay has depths of 4 fathoms and under. The large circular basin at its eastern end is barred by a flat with only one foot of water over it, and is separated from the North side of Posiette Bay by a narrow sandy isthmus.

Trinity Bay, or *Swaiteeya Troitsa*, the N.E. angle of Posiette Bay, is 3 miles in extent, and 1½ to 2 miles in width, with regular depths of 10 fathoms and under, affording spacious and secure anchorage, bottom of mud and sand. On the West side of the entrance is a remarkable conical hill. There are several villages along the eastern shore.

Vityaz Bay, to the S.E. of Trinity Bay, is not recommended as an anchorage, being subject to violent squalls from the wooded slopes of Mount Tumannaya.

Page 769.—**PETER THE GREAT BAY** forms the approach to the important Russian naval station of Vladivostok; and, consequently, the dangers lying around the islands near the fairways are marked by buoys and beacons, as shown on the chart. The latest Russian charts place the coasts and islands 2 miles West of the positions on the British charts. The tidal streams are weak, and their direction dependent on the wind.

Korsakov or *Peleis Island*, about 11 miles E.N.E. of Cape Gamova, is 650 ft. high, and has no fresh water on it. Temporary anchorage may be found in 5 fathoms, in the bay on its western side, during northerly and easterly winds.

Dalevron Islet has fresh water on it, and there are beacons for marking the positions of the rocks South of it.

Stenin or *Redcliffe Island* is about 520 ft. high, thickly wooded, and has fresh water. *Boisman Rock*, of 7 ft., lies 11 cables S. by W. ¼ W. from its South point; and *Ivanova Shoal*, of 3½ fathoms, lies 1 mile westward of its centre. These dangers are both marked by *buoys*, and by beacons on the island.

Coast.—The bay northward of Cape Gamova is frequented by fishermen, and a stream of good water runs into it. All this coast is hilly and thickly wooded, with some off-lying islets and rocks, and at 10½ miles northward of Cape Gamova is the remarkable rugged summit of *Mount Grebenchataya*. Anchorage may be found in the bays, with off-shore winds. *Kapzangou River* runs into the head of *Boismana Bay*, westward of Clarke Point; there are villages at its entrance, and about 5 miles up it is *Riazanova*, where there is a telegraph and post office. *Clarke Point* is high, barren, and precipitous.

AMUR BAY is not so subject to fog as Ousuri Bay, and the tidal streams are weak. Northward of Posiette Bay, the coast is all obstructed by solid ice for 3 or 4 months in winter, and the upper part of the bay is then thickly frozen over. By the end of January, the southern boundary of the ice reaches as far South as a line joining Rickorda Island and Sidimi Bay.

Slavianski Bay affords good anchorage in *Tulamu Bay*, its southern arm, in 4 to 8 fathoms, mud, sheltered from southerly and westerly winds. Here there is a small military settlement, where a few fresh supplies and water may be had. There is also a village at the head of the northern arm, which is open to the swell sent in by the S.E. winds of summer.

Sidimi Bay, 4 miles north-eastward of Slavianski Bay, is exposed to S.E. winds. Its inner shores are low and marshy, and coal has been found in the vicinity.

Mongugai River, in about lat. 43° 6½ N., has a life-saving station on the North side of the entrance. Hereabout the coast is low and marshy.

Page 770.—**Sui-fun River** entrance is fronted by a bar over which the depth varies from 1 to 4 feet. Coal of poor quality exists hereabout. Off the entrance lies *Ryechnoi Islet*, about 70 ft. high, with a lifeboat station.

Light.—A *fixed bright* light, elevated 120 ft., and visible 16 miles, is shown from a stone turret on Ryechnoi Islet; a *Bell* is sounded in foggy weather.

MURAVIEF AMURSKY PENINSULA, separating Amur and Ousouri Bays, is hilly and thickly wooded, rising to an elevation of about 1,500 feet. The western coast

is fronted by rocks and shoals, but there are no known off-lying dangers. *Shkota Peninsula*, its S.W. extreme, is lofty and precipitous, forming the western side of the Golden Horn, or the harbour of Vladivostok.

Kazakavitch or Russki Island rises to an elevation of about 1,000 ft., its eastern and southern coasts being rocky and precipitous. The bays on its western side afford shelter from the S.E. winds of summer. The island is said to be infested with snakes.

Novik Bay decreases in depth to 4 fathoms at about 2½ miles from its head, and its wooded shores are steep. The rocky banks on each side of the entrance are marked by *buoys*. At 1 mile within the entrance it is now connected with the Eastern Bosporus by a canal 15 to 18 ft. deep, cut for the use of torpedo and other vessels.

Starka Strait, separating Kazakavitch and Popov Islands, is very narrow, with a depth of 13 feet.

New Jigit Bay, at the South end of Starka Bay, is exposed to a heavy swell from the S.E. in summer.

Popov Island is 521 ft. high, partly wooded, and on its N.W. side is a cove named *Aleksyeeva Bay*, with depths of 5 to 7 fathoms, affording shelter from southerly and easterly winds. It is connected with Reineke Island by a rocky flat, with an islet on it, and a chain of islets and rocks extends off its S.E. point.

Reineke Island is 532 ft. high. About 1 mile off its N.W. point is *Kozlova Islet*, and 1 mile farther out are the *Two Brothers*, a group of pointed rocks. The *beacon* on the outer *Virkhovski Islet* was a white pyramid or tripod with a rhomboidal topmark, at an elevation of 148 ft.; seals are said to frequent these rocky islets.

Rickord Island is 560 ft. high, and was used as a game preserve. *Tsivolko Islet* is 155 ft. high, and is reported not to be perforated; the *beacon* on it was a *red* pole bearing a cask.

The EASTERN BOSPORUS has depths of 10 to 25 fathoms in the fairway, which is not encumbered with detached dangers. The projecting points are all marked by buoys or beacons, arranged on the Uniform System (*see Addenda for page* 725), but they must not be implicitly relied on. Anchorage may be found in the bays on either side, according to the wind. A *red bell buoy* marks the extremity of Cape Tokarefski spit, and other buoys mark its eastern and western sides.

Lights.—The reported light on *Cape Tokarefski* spit does not exist.

Larionoff Point light shows *bright* between N. 79° W. and N. 83° E.; *red* thence to N. 86° E.; and *bright* thence to S. 79° E., the *red* sector leading southward of Tokarefski spit. In foggy weather a *Bell* is struck *twice* at intervals of not more than 3 *minutes*.

Page 771.—*Pospaloff Point* beacons are white pyramids. The upper light is *bright*, elevated 29 ft., and visible 10 miles; the lower light is now *red*, and elevated 22 feet.

Skrypleff Island is about 160 ft. high, and has one white cross *beacon* on its East end; this in line with the *black* stripe on the fog-signal building marks the direction of the reef extending 2 cables northward of the island, the northern extremity of which is marked by a *white bell buoy*. The sunken rock reported to lie 7½ cables to N.W. ½ N. does not exist.

Lights.—The lighthouse is a square white tower, 25 ft. high, the light being elevated 173 ft., visible 19 miles, but obscured by Kazakavitch Island westward of S.W. by S. The light on the white pyramid beacon, 80 yards to N.W. ½ N., is now *fixed red*, elevated 130 ft., and visible 10 miles. In foggy weather, a *Siren* sounds a blast of 7 *seconds* at intervals of 1 to 2 *minutes*; if not available, a *Bell* is struck *twice* at intervals of not more than 3 *minutes*, and a *Gun* will be fired at intervals of 5 to 10 *minutes* in answer to guns at sea.

The GOLDEN HORN, PORT VLADIVOSTOK, or Solotoi Rog of the Russians, is about 3 miles in extent, and half a mile in width, with depths from 12 to 6 fathoms. It is easily accessible to vessels of the largest size, and its shores and approaches are well marked by buoys, beacons, and leading lights. The slopes of the hills are covered with forests of oak and other timber, abounding with tigers, bears, wolves, boars, and deer. Coal of inferior quality is found in the vicinity, and is mined to a small extent.

VLADIVOSTOK, signifying "Lord of the East," was founded in 1860 as a Russian military and naval station, and large sums have been spent over its fortifications and appliances. In 1900, however, the seizure of Port Arthur by the Russians promised to eclipse its importance, especially on the completion of the Trans-Siberian railway in 1903; but since the expulsion of the Russians from Port Arthur by the Japanese in 1905, it regains its original position, as the principal Russian port on the Siberian eastern coast. The distance by railway from St. Petersburg is 5,842 miles, the journey now occupying from 12 to 14 days. The construction of the railway cost approximately £100,000,000.

The town consists mostly of wooden houses, and the church with several domes is conspicuous; it contained about 30,000 inhabitants previous to the disastrous war with Japan. It is visited regularly by several lines of steamers, and is connected by telegraph cables with Nagasaki. Supplies of fresh meat, fish, vegetables, and potatoes are abundant, but fresh water is sometimes scarce and bad. Japanese and Saghalin coal is stored here in considerable quantities, and can be put on board from a pier reaching into 15 ft. water, or by lighters. The railway is brought down to the quays in the western angle of the harbour, which have depths of 26 to 33 ft. alongside, and are provided with warehouses, cranes, etc. Vessels lying at the anchorage load or unload by means of lighters, and can be supplied with stone ballast if required. The steam-tugs and icebreakers are provided with pumping and diving apparatus, to assist vessels in distress. The observation spot, in the harbour-master's garden, is now placed in long. 131° 53′ 22″ E.

There is a dry dock here, 575 ft. long, with an entrance 90 ft. wide, having 30 ft. over the sill at high water springs. There is also a pontoon dock 368 ft. long, constructed in 5 sections, and capable of raising a weight of 10,623 tons. Two other dry docks, about 700 ft. long, were under construction. Repairs can here be executed for vessels and their machinery, and there are cranes for lifting weights up to 100 tons.

Winds, etc.— The average annual rainfall here is 21 inches, mostly falling in summer, when S.E. winds prevail, and fogs are frequent at night. In winter, when N.W. winds prevail, the atmosphere is extremely dry, and almost free from fog.

The inner part of the harbour freezes over about the middle of December, and by the end of the month it is frozen as far as Egerscheld Point. At the beginning of January the western part of the Eastern Bosporus is frozen up, and by the middle os January it is frozen out to Skrypleff Island. By the end of March, the Bosporus if usually clear of ice again, and by the middle of April the harbour is clear. In winter, a channel is kept open by means of icebreakers out to Ousuri Bay, the western approach not being thus opened.

Capt. Schipper, of the steamer *Daphne*, 1902, says it is not advisable for ordinary vessels to venture here between the end of December and the middle of March, owing to the danger arising from the drift-ice then met with in the approaches.

Tides.—It is high water at Vladivostok, on full and change, at 2h. 30m.; springs rise 12 to 18 inches. The tidal streams are weak, only attaining a rate of 2 knots in the narrows. In summer, the mean level is 3 ft. higher than in winter, owing to the prevailing S.E. winds.

Pilots.—There were no regular pilots, but it was announced in 1906 that, if required, one may be obtained from Askold Island lighthouse. Vessels are not allowed to enter or leave the harbour at night.

Page 772.—**Lights.**—The lights on *Cape Goldobin* are shown from two white towers 26 and 19 ft. high, and 117 yards apart. The upper light, *red*, is elevated 64 ft., and the lower light, *white*, 57 ft.; in line, bearing E.N.E., they lead eastward of Tokarefski spit. They are both shown southward between S. 39° E. and N. 39° W., and are visible 13 miles. In foggy weather, the larger *Bell* is sounded at intervals of not more than 3 *minutes*.

On *Egerscheld Point*, on the West side of the entrance of the Golden Horn, is a tower 23 ft. high, showing a small *fixed bright* light southward between N. 75° E. and S. 75° W.

Two *fixed red* lights are shown on iron masts among the trees in the West side of the Admiralty garden, and in line bearing N.E. by N. they lead up the fairway to the anchorage. The inner light, elevated 94 ft., is shown above a red house, and the outer ight, at 77 ft., on a red triangle. The eastern light on the Admiralty pier is *green*, and the other *red*; three *bright* lights are also shown on each side of the pier.

Time Signal.—A ball is hoisted on a mast on the Port Office, eastward of the Admiralty pier, at 11h. 55m., and dropped at noon, local mean time, equivalent to 15h. 12m. 26·5s. G.M.T.; a gun is fired at the same instant, but the signal is stated to be unreliable.

Storm Signals.—Should telegraphic information be received, announcing the approach of a typhoon to the Sea of Japan, two white cones will be hoisted on the Port Office mast.

Deviation Beacons.—Three white triangular beacons have been erected to assist in adjusting compasses. The two beacons on Churkin Point in line bear *S.* 79½° *E. true*; the western beacon in line with one on Klet Point, *N.* 16° *E.*; and the eastern beacon in line with the latter, *N.* 25° *E.*

Anchorage.—The usual anchorage for large merchant vessels is in 11 to 12 fathoms, mud, in the western part of the harbour, but is rather confined. Its limits are defined by the parallels of Klet Point and Portovoi Spit on the South and North, and on the

East by the line of two beacons in the Admiralty garden. The area eastward of this is all reserved for war-vessels.

Directions.—In clear weather, there is no difficulty in reaching Vladivostok, by either the eastern or western approach, but the navigation is often embarrassed by the summer fogs. In early winter, when stormy north-westerly winds prevail, vessels are recommended to approach by way of Amur Bay, so long as ice will permit; and in summer there is also said to be less fog on this route. The principal landmarks are the lighthouses on Cape Gamova and Askold and Skrypleff Islands; the beacons on Virkhovski and Tsivolko Islets; and the conical Karamzin Island.

Caution.—In March, 1907, a warning was issued that explosive floating mines are still adrift in the approaches to Vladivostok, forming a serious danger to navigation. Mariners are advised to make the port only by daylight, and to give a wide berth to any floating object sighted.

In entering by the eastern approach, vessels usually pass northward of Skrypleff Island, the lighthouses on which kept in line astern will lead in the fairway to the harbour entrance, when the Admiralty garden *red* lights in line will lead on to the anchorage.

If approaching from the West, the light beacons on Pospaloff Point in line will lead in southward of Tokarefski Spit, after passing which bring Pospaloff Point light beacons in line, and keep on this line till the Admiralty garden lights come in line as before directed.

Page 772.—**Patroclus Bay** is open to the S.E. swell of summer, and is only thinly frozen over in winter. There is a good road hence to Vladivostok.

Ulysses Cove and *Diomedes Inlet* are usually accessible in winter, and there is a coal store in the latter.

OUSOURI or USSURI BAY is about 22 miles in width at its entrance between Kazakavitch and Askold Islands, and extends about 30 miles north-eastward, gradually decreasing in width. It has moderate depths of water, and no known dangers except those near the shore. The coasts are mountainous, and its bays and coves only afford shelter for small vessels. Its shores are partly cultivated, especially around Sukhodol Bay.

Ousouri Bay is subject to fog in summer, but in its northern part it is not usually so thick as in the entrance. From January to March, the entrance of the bay is usually full of floating ice, while the northern part freezes over.

Muravinaya Bay, the head of Ousouri Bay, is shallow, and on the river running into its N.E. angle is the large village of *Shkotovo*, in communication by road with Vladivostok. On the western side of the bay is *Tavaiza Cove*, where lime is made.

Sukhodol Bay has regular depths under 7 fathoms, bottom of mud and sand, and is stated to be always free from fog. *Andreeva Bay*, 4 miles southward, is sheltered by a sunken reef, extending three-quarters of a mile N.N.E. of *Hangan Point*, its S.W. extreme, and affords anchorage in 7 fathoms and under.

Suisoeva Bay, 4 miles northward of Askold Island, has several sandy beaches, and affords anchorage for large vessels in 8 fathoms and under, fine sandy bottom. Gold is found in the vicinity.

Askold Strait, northward of Askold Island, is specially subject to dense fogs in summer.

ASKOLD ISLAND rises to an elevation of 1,176 ft., and below the bare summits of the ridges is densely wooded. It is used as a preserve for deer and wild goats, and there is a good road across it from the N.E. point to the lighthouse. The coast is mostly precipitous, with a few off-lying rocks. *Nayezdnik Bay*, on its S.W. side, is open to the swell, but anchorage may be found near its head, in 8 to 10 fathoms, mud. There are gold workings here.

The LIGHTHOUSE is a red hexagonal tower 40 ft. high, and the light *revolves* every *minute*, at an elevation of 590 feet. In fogs, the *Bell* is sounded at intervals not exceeding 3 minutes; and the *Gun* is fired at intervals of 5 to 10 minutes, in answer to guns at sea. There is a *Signal Station* here, and passing vessels are requested to pay attention to signals made to them. A pilot for Vladivostok might be had here.

STRELOK BAY is the bight eastward of Maidel Point, the precipitous eastern headland of Suisoeva Bay; in winter, it only freezes over in its northern part. There is cultivation in places, and gold workings near its eastern point. *Abrek Bay* has depths of 12 fathoms and under, and would afford secure anchorage during the northerly winds of autumn.

Putiatin Island is 6 miles in extent, and of very irregular outline, rising to an elevation of 1,155 ft. near it northern end. It is marshy in places, and wooded in its northern part. *Nazimova Bay*, on its N.W. side, affords anchorage in 8 to 10 fathoms,

mud ; there are some brick and pottery works here. The southern point of the bay is connected with the mainland by a flat with only $3\frac{1}{4}$ fathoms over it.

Pages 772-773.—**Vostok Bay** is marshy at its head. *Gaidamak Bay*, on the West side of the entrance, affords anchorage in 6 to 7 fathoms, mud ; the harbour has depths up to $3\frac{1}{2}$ fathoms, and there is a whale-fishing station here, but it is frozen over in winter.

Page 773.—**America Bay** is 6 miles in width, with depths decreasing gradually from 20 fathoms in the entrance towards the low sandy shore at its head. It is open to the southerly swell of summer, and after rainy weather the water is much discoloured by the mud brought down by Suchan River. *Kreiser Rock*, of 10 ft., lies $2\frac{3}{4}$ miles E.N.E. of Lisi Islet, and is marked by *spar buoys*, and by *beacons* on the point $1\frac{1}{2}$ mile to N.E $\frac{1}{2}$ N. ; another beacon 1 mile to S.E. of these, in line with the South slope of a rocky islet, acts as a cross-mark.

Nakhodka Bay, the N.W. arm of America Bay, affords sheltered anchorage in $4\frac{1}{4}$ fathoms, mud, but is frozen over in winter. On its eastern side is a Russian and Chinese settlement, whence there is a road to Vladivostok.

Suchan River entrance is subject to changes. There is a considerable Russian and Chinese population along its valley. Lime is made near its entrance, and up the river are some mines of coal.

Kosmin Bay affords only temporary anchorage in 7 to 12 fathoms, and at its head are some salt-works. Stores for Povorotni Point lighthouse are landed here.

POVOROTNI POINT LIGHTHOUSE is an octagonal white stone tower 26 ft. high, with a red dome, showing a *fixed bright* light, elevated 406 ft., and visible 27 miles southward between N. 54° E. and N. 24° W. In foggy weather, a *Siren* sounds a blast of 5 to 7 *seconds* every *minute*, and a *Gun* is fired in answer to guns at sea. A *Bell* may also be sounded.

Tcheniya Bay is now known as *Uspeniya* ; there are some settlements here.

Page 774.—**NIZMENNI POINT, or Low Table Point, Lighthouse** is a white stone tower 47 ft. high, showing a *triple-flashing bright* light, elevated 208 ft., and visible 20 miles ; three flashes in 14 *seconds*, and then an interval of 23 *seconds*. In foggy weather, a *Siren* sounds a blast of 4 *seconds* at intervals of $1\frac{1}{2}$ to 2 *minutes* ; and a *Bell* sounds *two* strokes at intervals not exceeding 3 minutes.

Pages 774-775.—**OLGA BAY** entrance is in lat. 43° 41′ N. *Cape Linden* is a white chalk cliff. *Chikacheva* or *Brydone Island* is 385 ft. high, and connected with the shore by a reef ; on its summit is a white tower 35 ft. high. Fogs are frequent here from March to July, but chiefly at night.

Page 775.—**ST. VLADIMIR BAY** is usually covered with ice from December to February. *North Bay* affords good anchorage in 14 to 15 fathoms. The streams abound with salmon, and game may be shot.

Page 776.—**The COAST** between St. Vladimir Bay and Castries Bay was reported by the officers of the Russian corvette *Rynda*, 1888, to be out of position on the chart as regards longtitude, gradually increasing northward to 8′ or 9′ too far West at St. Alexander and Baklanii Points.

Oprichnik Bay is now placed in lat. 44° 27′ N.

1907.

Pages 777-779.—**JAPAN**.—The Empire of Japan now extends over a line of about 28° of latitude, including the Kurile Islands on the North and Formosa on the South, with an extent of over 1,900 miles. The area of the four principal islands (Hondo or Honshiu, Hokkaido or Yezo, Kiushiu, and Shikoku) amounts to about 148,000 square miles, with a coast-line exceeding 15,000 miles. The incorporation of the Riu-kiu (Loochoo) Islands in 1876 ; the cession of Formosa and the Pescadores by China after the war of 1894 ; and the cession of the southern half of Saghalin by Russia in 1905 ; together with the Bonin and other islands ; have raised this area to upwards of 175,000 square miles. *Hondo or Honshiu*, the principal island, has an area of 92,000 square miles, and is thickly populated, the inhabitants numbering 35,460,507 in 1904. Its soil is very fertile in the district around Tokyo, but elsewhere it is mostly sandy.

The official figures for 1906 estimate the population at 50,871,937 (including Taiwan or Formosa 3,059,235), or considerably in excess of that of the British Isles. Though the area available for the cultivation of rice, wheat and other cereals, tea, silk, tobacco,

&c., is only estimated at one-sixth of the total, the bulk of the people live by agriculture, though they are now making strenuous efforts to compete with European and American manufactures in the trade of the East. Railways have been largely extended, having a total length of 4,693 miles in 1905, and the main island is traversed by them from end to end, so that it is now possible to travel by railway from Nagasaki to Aomori, a distance of 1,250 miles, broken only by the short ferry across Shimonoseki Strait. Eventually the line will be completed to Kagosima in the extreme South. There is telegraphic communication with all places of any importance.

Shipbuilding of all kinds, up to the finest warships, with the manufacture of the material, their necessary engines, and accessories, are now successfully carried on; and large factories produce cotton, silk, and metal goods, glass, matches, &c., chiefly in Osaka.

Extensive deposits of iron and copper ores, sulphur, and coal exist and are largely worked, and mines of gold and silver produce considerable quantities of the precious metals. Lead, manganese, and antimony are also mined. The best coal is worked at Takashima, near Nagasaki; the next quality being shipped at Kuchinotsu from the Miike mines; and the cheapest at Moji, near Shimonoseki. Petroleum is found in several districts, but is chiefly worked in the provinces of Echigo and Totomi, adjacent to Sado Island.*

Page 779.—**Treaty Ports.**—Foreign trade is chiefly carried on at Tokio, Yokohama, Hiogo or Kobe, and Nagasaki; Niigata, Osaka, and Hakodate are also open ports; but the following ports are only open to foreign vessels so long as a certain amount of trade is carried on annually:—In Honshiu:—Fushiki, Hamada, Itozaki, Miyadsu, Nanao, Osaka, Sakai, Shimidzu, Shimonoseki, Taketoyo, Tsuruga, and Yokkaichi. In Kiusiu:—Aomori, Hakata, Karatsu, Kuchinotsu, Misumi, Moji, and Wakamatsu. In Yezo:—Hakodate, Kushiro, Mororan, and Otaru. In Tsu-sima:—Itsuhara, Sasuna, and Shishimi. Vessels visiting these ports are subject to harbour regulations, which are of the usual character.

Japan has come to the front as an important political and commercial power, leading to the abolition of the foreign settlement system in 1899, and foreigners are now equally with Japanese subject to the imperial laws of the country.

There are government engineering works and dry docks for large vessels at Yokoska, Kure, Hakodate, Sasebo, and Nagasaki, and smaller docks at Yokohama, Osaka, &c., all hereafter described. Steamers can obtain supplies of coal at Kobe, Shimonoseki, Yokohama, and Yokoska, in Honshiu; at Hakata, Karatsu, Kuchinotsu, Misumi, Moji, Nagasaki, and Sasebo, in Kiusiu; and at Akeshi, Endermo, Hakodate, Otaru, and Sutt Bay, in Yezo.

In 1905, the value of the exports from Japan was £32,823,222, chiefly silk and silk goods, tea, matches, cotton goods, copper, and coal, the latter article amounting to 2,507,527 tons, or about one-third of the total output. The imports were valued at £49,871,587, chiefly cotton and cotton goods, woollen goods, metals, machinery, sugar, chemicals, beans, flour, petroleum, leather, rice, and oil-cake. In that year, vessels entering the open ports numbered 8,560, with a tonnage of 14,357,326. Japanese trade and shipping are rapidly increasing.

Money.—The currency of Japan was founded on a gold basis in 1897, after the payment of the war indemnity by China. The unit is the *yen*, of 100 *sen* or 1,000 *rin*, equivalent to 2*s.* 0½*d.* There are gold coins of 5, 10, and 20 yen, but not in common use; silver 5, 10, 20, and 50 sen; nickel, 5 sen; and bronze 1 and 2 sen and 5 rin. Paper replaces gold to a large extent in ordinary transactions.

Weights.—1 *Momme*=2·12 drachms avd.; 160 momme=1 *Kin*=1·323 lbs. or 600 grammes; 1,000 momme=1 *Kwan*=8·27 lbs.; 1 *Picul*=132⅓ lbs.

Measures.—10 Bu=1 *Sun*=1·193 inch; 10 sun=1 *Shaku*=11·93 ins.; 10 shaku=1 *Jo*=9·94 ft.; 6 shaku=1 *Ken*=1·99 yard; 60 ken=1 *Cho*=358 ft.; 36 cho=1 *Ri*=2·44 stat. miles; 1 Kai-ri or marine ri=1·15 mile; 41 ri=100 stat. miles.

For dry goods, 1 *Sun*=1·39 inch; 1 *Shaku*=14·91 ins.; 1 *Tan*=about 11 yds.; and 1 *Hiki*=about 22 yds.

For capacity, 1 *Go*=10 shaku=1·27 gill; 10 go=1 *Sho*=1·59 quart; 10 sho=1 *To*=3·97 gallons; 10 to=1 *Koku*=39·70 gallons liquid, 4·96 bushels, and one-tenth of a ton in the capacity of a vessel.

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* Among the numerous authorities consulted for these and subsequent details, we may mention "The Fifth Financial and Economical Annual of Japan," Tokyo, 1905; "Commercial Japan in 1904," U.S. Government publication; "Outlines of the Geology of Japan," Tokyo, 1902; and "The Industries of Japan," by Prof. J. J. Rein, 1889, beautifully illustrated.

Superficial measure, 1 *Tsubo* = 36 square shaku = 3·95 square yards; 30 tsubo = 1 *Se* = about 119 sq. yds.; 10 se = 1 *Tan* = 0·245 acre; 10 tan = 1 *Cho* = 2·45 acres; 1 square ri = 5·955 sq. miles.

Time.—For railway and other purposes the meridian of 135° E. is used as standard time, being 9 hours in advance of Greenwich.

Uniform Buoyage.—A uniform system has been adopted by Japan, the terms port and starboard being used to signify the approach from sea, similar to European systems.

Starboard hand buoys are *conical red*, surmounted by a *red* cone base downwards, with *even* numbers.

Port hand buoys are *conical black*, with a *cylindrical* topmark, and *odd* numbers.

The *outer* end of a *middle ground* is marked by a *conical* buoy, *black* and *white bands*, surmounted by a *diamond* topmark; the inner end by a *conical* buoy, *red* and *white bands*, surmounted by *two cones* points together.

Small isolated dangers, which may be passed on either side, are marked by *conical* buoys, *spar* buoys, or *cylindrical* beacons, all painted in *red* and *black bands*, surmounted by a *red ball*.

Wrecks are marked by *green* bell-shaped buoys.

Climate.—The rainfall in Japan is greatest in the S.E., especially on the East coasts of Kiusiu and Shikoku, where the annual fall varies from 90 to 100 inches; and on the middle of the western coast, where it reaches 100 inches. In the South, the most rainy month is June, and September follows next, but on the middle of the East coast the latter month is the wettest. On the West coast July and November are the rainiest months.

Fog prevails off the eastern coasts of Japan from May to August, but it is stated to be often clear near the coast when dense fogs prevail in the offing. On the western coast it is also prevalent in summer, especially in the vicinity of Tsugaru Strait. Around Yezo, dense fogs prevail in June, July, and August.

Page 781.—**Storm Warnings.**—The signals made are now as follows:—1. A *red* ball, or *red light*, indicate probable strong winds or gales. 2. A *red cone*, or *two red lights* horizontal, indicate a very serious atmospheric disturbance is probable.

Wind and Weather Signals are also made by means of flags, thus:—*White burgee*, winds between N.W. and N.E.; *blue*, between N.E. and S.E.; *red*, between S.E. and S.W.; *white* and *red*, between S.W. and N.W.

White flag (*square*) fine; *red*, cloudy; *white* and *red*, changeable; *blue*, rain; white, with *red* horizontal and diagonal *crosses*, snow; *red* and *white bands*, fog; *red*, with small *white square* at top, frost. *Blue weft*, cold; *red*, warm.

Page 782.—**Earthquakes, etc.**—The number of volcanic peaks in Japan is placed at 165, of which 54 are in active eruption, but the surface area occupied by volcanic strata is less than one-fifth of the total area of the islands. They are most abundant in the Kurile Islands, Yezo, northern Honshiu, Kiusiu, and the Oshima Islands.

Earthquakes are of constant occurrence, but are more frequent in the southern regions; an analysis of records shows that, on an average, there are three or four shocks daily. On October 28, 1891, the richly cultivated plain in the provinces of Mino and Owari, in central Japan, was suddenly devastated by an earthquake, practically destroying all the buildings, and causing the death of 7,279 persons.* It was felt over an area of nearly 100,000 square miles.

Surveys.—The Japanese government has made accurate surveys of the Empire, and the charts are practically sufficient for safe navigation, but must be used with due precaution. An interesting illustrated paper on "The Early Cartography of Japan," by G. Collingridge, is given in the "Geographical Journal," May, 1894, pages 403-409.

Page 783.—**KIUSIU** has an area of 16,840 square miles, and in 1904 the population numbered 7,260,910.

Pages 783-784.—**VAN DIEMEN or Osumi Strait.**—The 8-fathoms spot reported by H.M.S. *Roebuck* was not found by the Japanese surveyors. Off Satano misaki and the North point of Tanega sima the Kuro Siwo, or Japan Stream, runs from 2 to 5 knots an hour, causing rips off these points.

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* An interesting illustrated account of this catastrophe, by C. Davison, F.G.S., will be found in the "Geographical Journal," June, 1901, pages 635-655. The subject is also interestingly treated by J. Milne, F.G.S., in a paper on "Sub-Oceanic Changes," in the same Journal for August and September, 1897. See, also, another illustrated paper by C. Davison, "On the Distribution of Earthquakes in Japan," in the Journal for November, 1897.

Page 784.—**SATANO MISAKI Lighthouse** is an octagonal white tower, standing in lat. 30° 59′ 30″ N.

Page 785.—**KAGOSIMA GULF.**—*Racehorse Shoal* extends about 1¼ mile off shore. *Parker Shoal*, or *Kami se*, is marked by the ruins of the fort.

KAGOSIMA had about 59,000 inhabitants in 1904, engaged in cotton weaving, and the manufacture of porcelain, etc. At 1 mile northward of it is a conspicuous high chimney. A railway is being constructed to join the line from Moji and Nagasaki, the province of Kagosima yielding considerable quantities of tobacco, sugar, tea, cotton, hemp, indigo, rape, sweet potatoes, grain, and other agricultural produce, and horses are bred in large numbers. The gulf has a prosperous coral fishery, of both white and red varieties. Vessels anchor from 4 to 10 cables off shore, in 17 to 20 fathoms, but westerly gales may drive them into deep water.

Light.—The light is now shown on the South end of the breakwater.

Two *conical black buoys*, each bearing a *cylinder*, lie in 3½ fathoms, on the edge of the shoal extending northward from Kotsuki gawa, northward of Battery Point.

Page 786.—**Uchiumi ko,** 1½ mile southward of To saki, is only a boat harbour. On *Nishi jima* is a small *fixed light*, visible 6 miles; *bright* between S. 9° E. and S. 36° E., and *red* thence to N. 60° E.

North-westward of To saki, for a distance of about 1½ mile, the coast is fronted by reefs, the outermost being a 2½-fathoms patch at 1¾ mile N. 15° E. from To saki.

At 6½ miles northward of To saki is the mouth of the *Oyodo gawa*, up which is the town of *Miyazaki*, whence a railway is being constructed to Oita, on Beppu Bay.

Totoro ko Light.—At Totoro ko, in the rocky bay north-westward of Mi saki, is a white brick turret showing a *fixed* light, elevated 90 ft., and visible 6 miles; *bright* between N. 1° W. and N. 58° E., and *red* thence to S. 86° E.

Page 787.—**JIZO, Seki, or Sagano saki Lighthouse** is a white iron tower, 25 ft. high, showing a *triple-flashing bright* light every 20 *seconds*, elevated 225 ft., and visible 21 miles.

At 1½ mile S.S.W. of Jizo saki is *Tsuta sima*, 185 ft. high, on the summit of which is a *Signal Station.*

At 2 miles westward of Jizo saki is the town of *Saga no seki*, at the head of an inlet affording good anchorage in 5 to 6 fathoms.

Beppu Bay is the S.W. angle of the Iyo Nada, and on its southern shore is the large town of *Oita;* a *fixed bright* light, visible 6 miles, is shown on the mole. At 4 miles W.N.W. of this is the town of *Beppu*, where are some hot springs, and above it rises *Tsurumi san*, a bare volcanic mountain 3,619 ft. high.

On the North side of the entrance of Beppu Bay is the town of *Kitsuki*, at the head of a shallow bay, off the eastern side of which is the *Moriye* lighthouse, a red tower 33 ft. high, standing on a sandspit and showing a *fixed bright light*, visible 8 miles.

Page 787.—**The SOUTH COAST of SHIKOKU, or Sikok,** has been surveyed by the Japanese. This island is the least volcanic of the Japanese group, and has an area of 7,031 square miles; the population numbered 3,167,707 in 1904.

Isa saki is now known as *Ashizuri saki.*

Urado or *Wurato Inlet* is said to be accessible for vessels drawing up to 12 feet. There are large paper-mills near the town of *Kotsi.* The lighthouse is a white brick tower 20 ft. high, in long. 133° 34′ E.; the light is elevated 133 ft., and visible 8 miles seaward, between N. 10° W. and S. 67° W.

MUROTO SAKI, the S.E. extreme of Shikoku, is a steep wooded projection, with sunken rocks extending nearly a mile off it.

The Lighthouse on Muroto saki is a white iron tower 34 feet high, in lat. 33° 14′ 45″ N., long. 134° 10′ 30″ E.; it shows a *flashing bright* light every 10 *seconds*, elevated 497 ft., and visible 30 miles seaward, between N. 40° E. and N. 48° W.

Hence to I shima, at the entrance of Kii Channel, the coast is bold and mountainous, but should not be approached within 2 miles, to avoid the rocks and foul ground off it.

Page 788. **BUNGO CHANNEL.**—The tidal streams run with considerable velocity, attaining a speed of 3 to 4 knots in the narrows; off Sada misaki, the West extreme of Shikoku, they turn at 3 hours before and after high water. The shores on either side are well populated.

Okino sima is 1,306 ft. high, with some islets and rocks around it.

LIGHT.—**Mizunoko** or **Euryalus Islet,** in the centre of the southern part of the channel, is 90 ft. high, and on it stands a stone tower 120 ft. high, painted in black

and white bands; it shows a *flashing bright* light every *half-minute*, elevated 182 ft., and visible 20 miles.

Jizo saki Light.—See the Addenda for page 787.

Takanaba or *Taka sima*, on the western side of the northern entrance of Bungo Channel, is 473 ft. high, and covered with bamboos.

Port Misaki, 5 miles eastward of Sada misaki, affords good anchorage, sheltered from all but westerly winds. There is also safe anchorage off *Yawata hama*, a large town 17 miles farther eastward.

Uwajima Bay, the eastern angle of Bungo Channel, has several inlets affording secure anchorage. The town has about 15,000 inhabitants, and fresh supplies are plentiful; there is a sardine fishery here.

Pages 788-789.—**The SETO UCHI or Naikai,** "the sea within the straits," presents a varied panorama of unrivalled sub-tropical scenery, and may be termed the Mediterranean Sea of Japan, being used by vast numbers of vessels.

The *Uniform System of Buoyage*, described in the Addenda for page 779, is arranged by taking Kobe as the objective for vessels from sea.

Pilots have their headquarters at Kobe, their charge for guiding vessels between Nagasaki and Yokohama being the same whether they proceed through the Seto Uchi, or outside the islands. A pilot may be obtained at Rokuren Island or He saki, in Simonoseki Strait, but it would be advisable to telegraph or write to Kobe or Moji in advance.

Page 789.—**Kotsu sima Light.**—See the Addenda for page 881.

Koko or *Jino sima* is 688 ft. high, with a double summit. *Kurara se* or *Round Rock* is 64 ft. high. *Hatsushiro se*, 3½ miles E. by N. from the N.E. point of Koko sima, has 6 or 7 ft. water over it.

Page 790.—Eastward of Kanega saki, the point within Koko sima, a low sandy coast trends 5 miles eastward to the mouth of the shallow *Onga gawa*, and is free from danger. Hence to Iwaya saki the coast is fronted by sunken rocks.

Iwaya saki terminates in a conspicuous reddish cliff, about 50 ft. high, and hence eastward to Wakamatsu the low coast is fronted by sunken dangers.

Siro sima lie 14 miles E. by N. ½ N. from the N.E. point of Wilson Island. The North point of the N.E. island is a perpendicular cliff 365 ft. high. *Isaki haye*, 3 miles S. by E. of the eastern peak of the south-western Siro sima, lies 2¾ miles E. by N. ¾ N. from Iwaya saki.

Futaoi sima, or *Notch Island*, is 820 ft. high. *Ai-nosima* is 6 miles S. ½ E. from its South point.

Light.—On *Omoji iwa*, near the northern extreme of the reef extending northward from Ai-no sima, stands a conical *red* stone *beacon*, 42 ft. high, on which is shown a *fixed* light (burning *unattended*), elevated 45 ft., and visible 6 miles; it shows *bright* eastward over the safe approach, between S. 34° W. and S. 43° E., and *red* thence to S. 27° E. The *buoy* has been removed. Strangers must not attempt to pass westward of the beacon.

Shirasu, or *Low Reef*, is connected with the main at Wakamatsu by a shallow bar. The lighthouse (or *beacon*) on it now exhibits an *unattended flashing bright* light every 10 *seconds*, elevated 50 ft., and visible 12 miles.

Rokuren Island, or *Mutsure jima*, is 398 ft. high. The white lighthouse is 29 ft. high, and the light visible 15 miles northward between N. 35° W. and S. 17° W.

Tidal Signals.—Near the lighthouse is a signal station, where the following tidal signals are exhibited:—1. White ball, tide rising; lowered when it begins to fall. 2. Red cone, point up, stream running westward; point downward, eastward; lowered during slack. 3. White pennant, with the cone, when stream abnormally strong. 4. Red pennant, signals are suspended.

Page 791.—**HIKU SIMA.**—There are some phosphate of lime works at *Fuku ura*.

Daibahana Light.—On the western extreme of *Takenoko jima*, lying off the N.W. end of Hiku sima, is a white tower 30 ft. high, showing an *unattended fixed* light, elevated 76 ft., and visible 6 miles. It shows a *bright* sector over the fairway between S. 23° E. and S. 20° E.; *red* thence southward to S. 62° W.; *bright* thence northward to N. 48° E.; *red* thence to N. 73° E.; and *bright* thence to N. 86° E.

The occasional *light* at *Fuku ura* is discontinued.

SIMONOSEKI STRAIT, or Nagato seto, has a least depth of 26 or 27 ft. in the fairway at low water, which is on the bar at the eastern entrance. It is now well marked by lighted buoys, but the numerous dangers and the velocity of the tidal stream render navigation inadvisable without the aid of local knowledge. For particulars as to *pilots*, see the Addenda for pages 788-789.

Toridashi or *Funase Rock*, of 2¼ fathoms, lies 7 cables S. 38° W. from Daibahana lighthouse, and is marked by a *red buoy* on its northern side, bearing an *occulting bright light*, eclipsed for 2 *seconds* in every 6 *seconds*.

Kasase, of 6 ft., lies 1 mile S. 4° E. from Daibahana lighthouse, and a *red buoy* lies N.E. of it, bearing a *fixed bright light*.

Ozone, or *Hiku Flat*, has a least depth of 10 ft. near its eastern extreme, and is connected with Kokura Ledge. A *red buoy* lies off its eastern side, at 9 cables N.W. of Manaita iwa light beacon, and bears an *occulting red light*, eclipsed for 2 *seconds* in every 6 *seconds*.

Hamo Bank, or *Gomiyosesu*, has 2¾ fathoms least water, near its centre.

Manaita Rocks lie 4 cables southward of Entrance Head, and the *beacon* (27 ft. high) is painted *black*; an *unattended fixed bright light* is shown on the beacon, at 19 ft. above high water, and visible 6 miles.

Takase, a gravel patch of 3½ fathoms, lies 5½ cables S. by E. from Manaita Rocks beacon, and is marked by a *red buoy* on its N.E. side, bearing an *occulting light*. Two telegraph cables cross the strait within half a mile eastward of this buoy.

Naruse beacon is 22 ft. high and painted *black*; on it is shown an *unattended fixed green light*, elevated 17 ft., and visible 4 miles.

WAKAMATSU, 4 miles S.W. by S. from Daibahana lighthouse, has come into prominence in connection with the establishment of the Japanese Imperial Government steel works here. The works cover an area of about 350 acres, and are provided with modern appliances for producing steel plates, rails, etc., from the ore, which is brought by sea from the Hang-yang mines at Hupeh in China, and the Akadani and Kamo mines in Echigo. The coal is mined in the immediate vicinity, the output in 1906 amounting to 2,226,085 tons, of which 405,551 were exported. In that year the vessels entering numbered 293, with a tonnage of 238,039.

The harbour, originally very shallow, has been improved by dredging, and the construction of a breakwater over 1⅓ mile in length on the western side of the entrance. The channel is kept dredged to a minimum depth of 20 ft. at low water springs, up to the quays, which are provided with appliances for dealing rapidly with iron ore and coal cargo, the cranes lifting weights up to 25 tons.

Light.—On the extremity of the breakwater is a red iron tower, 25 ft. high, showing a *fixed red* light, elevated 29 ft., and visible 6 miles.

Buoys.—The approach to Wakamatsu is marked by the following *conical* buoys, each bearing a staff and *globe*:—No. 1, *red*, in 3 fathoms, 16½ cables N. 82° E. from the breakwater lighthouse; No. 1, *black*, 2½ cables E.S.E. of No. 1, *red*; No. 2, *black*, at 4 cables N. 75° E. from the lighthouse, and vessels should not attempt to pass southward of it, on account of sunken dangers. A *conical red* buoy lies 2½ cables S. 4° W. from the lighthouse, on the eastern side of the narrow dredged channel, which runs close along the eastern side of the breakwater. There are several mooring buoys in the harbour.

Pilots for Wakamatsu may be obtained at Rokuren Island or Moji; vessels entering pass between the two outer buoys, and then steer a direct course for the breakwater lighthouse.

Kokura, 3 miles eastward of Wakamatsu, has a small shallow harbour, and the railway here runs close to the shore. A *conical red buoy* lies half a mile to N.E. by N., in about 9 ft. at low water; and a *red cask buoy*, in 2½ fathoms, 1¼ mile to N.N.W. of the harbour entrance.

Midway between Kokura and Moji is the village of *Dairi*, where there is a large sugar refinery.

Page 792.—**Yodsibi Rock,** or *Yojibei iwa*, *beacon* is 26 ft. high, and bears an *unattended fixed red light*, at 19 ft. above high water, visible 6 miles westward between S. 16° E. and N. 74° E.

Ganryujima is an islet, with reddish cliffs, lying on shoals extending off the N.E. side of Hiku sima. A *black buoy* lies off the N.E. extreme of these shoals, at 2¼ cables N.E. of the S.E. end of the islet, and bear an *occulting bright light*, eclipsed for 2 *seconds* in every 6 *seconds*.

Koseto, the passage northward of Hiku sima, is only half a cable wide in its western part, and has a least depth of 9 ft. off Simonoseki.

SIMONOSEKI, or Akamagaseki, contained 51,454 inhabitants in 1906, and is connected with the Japanese railway and telegraph systems. It may be considered as forming one port with Moji, on the opposite side of the strait, and in 1906 they were visited by 6,979 vessels, with a tonnage of 7,906,823. There is a daily service of steamers to Fusan, Korea. In 1906, the imports were valued at £2,360,400, chiefly cotton, sugar, rice, beans, etc., machinery, flour, and petroleum; the exports, £2,268,819, were chiefly coal, cotton yarn, refined sugar, cement, and timber.

Supplies of fresh beef, vegetables, fruit, and good water are plentiful, the latter being brought in pipes from a distance of 8 miles. Coal can be supplied in any quantity, with quick despatch.

MOJI, the northern terminus of the Kiusiu railway system, lies 1 mile E.S.E. of Simonoseki, and contained 49,252 inhabitants in 1906. It has rapidly come to the front as a port of shipment for the good bituminous coal mined in the vicinity, the output of which was upwards of 3,500,000 tons in 1906, and 2,034,226 tons were exported. It is brought off in lighters. There are also cement works here. The mail steamers call here on their way through the strait.

Moji Bay, comprised between Moji saki to the N.E. and Shiroki saki to the S.W., is fronted by Moji Shoal, and the coast is bordered by a shallow bank, named *Utchisu*, the depths between varying from 4 to 6 fathoms, and is out of the strength of the tidal streams.

Harbour Regulations.—On account of the great number of vessels frequenting this anchorage, special regulations are in force to ensure safety. The harbour is divided into three districts:—1. Inshore of a line N.E. from two pole beacons on Shiroki saki, for vessels under 800 tons. 2. Between this limit and a line drawn S. 47° W. from two pole beacons on Kajiga hana (the S.W. extreme of the Moji peninsula) for steamers over 800 tons. 3. Between the latter line and a line S. 48° W. from Moji saki (passing outside Moji Shoal) for sailing vessels over 800 tons and war-vessels.

Vessels bound to Moji must hoist their national flag and registered number, if from the West off Rokuren lighthouse, and if from the East off He saki lighthouse, and a telephonic message from Moji will be signalled as to the berth they are to occupy. In bad weather, the following signals will indicate the berth to be taken:—Flag H, In District 1. Flag J, In Dist. 2. Flag K, In Dist. 2, East of a line South from Moji Shoal N.E. buoy. Flag L, In Dist. 2, East of a line South from Moji Shoal S.W. buoy. Flag N, off Kusuhara, outside the southern limit of the harbour. Flag P, In Dist. 2 or 3. Flag R, In Dist. 2, East of a line N.N.W. from Shiroki saki. Flag T, In Dist. 3.

If coming from the East, when abreast of Danno ura lighthouse, steamers must give three long blasts of their whistle or siren at short intervals till past Moji saki; and steamers bound East from Moji must do the same.

Vessels entering take precedence of those leaving the harbour. No vessel may anchor within 150 yards of Moji Shoal N.E. buoy, or within 2 cables of the S.W. buoy.

Should telephonic communication with Rokuren Island or He saki be interrupted, anchorage signals will then be made from signal staffs at half a mile S.W. of Shiroki saki and near Moji saki.

Moji Shoal is about a mile in extent, with $1\frac{1}{4}$ to 4 fathoms over it, and is liable to changes; it is steep-to at its N.E. end, which is marked by a *buoy, red* and *white bands*, bearing an *occulting bright light*, eclipsed for 2 *seconds* in every 6 *seconds*, lying in 4 fathoms. The S.W. end is marked by a *buoy, black* and *white bands*, and bearing a similar *occulting red light*, in 3 fathoms.

On the opposite side of the strait, off Simonoseki, is *Kannon saki buoy, black*, bearing a similar *occulting red light*, in 5 fathoms.

Tides.—It is high water in Moji Bay, on full and change, at 9h. 17m.; springs rise $9\frac{1}{4}$ feet, neaps 6 feet. At He saki lighthouse, at 9h. 5m., and here springs rise 14 feet. The stream begins to set westward at $2\frac{1}{2}$ hours before high water, and eastward at $2\frac{1}{2}$ hours after, the latter thus running about 7 hours. In Moji Bay, the strength is less than 1 knot, generally setting north-eastward.

Climate, &c.—During observations extending over 10 years, the temperature at Simonoseki varied between extremes of 20°F. in February and 97° in August. The average annual rainfall was 61 inches, chiefly falling from May to September, July being the wettest month with an average of 12 inches. Easterly, N.W., and westerly winds are the most prevalent, the stormiest months being from December to June. Fog is infrequent, and none was experienced from August to January.

Page 792.—**HE or I SAKI Lighthouse** is a white granite tower 21 ft. high; the light is now *flashing* every 15 *seconds*, elevated 122 ft., and visible 17 miles, showing *red* northward between N. 78° W. and S. 46° E., and *bright* thence to S. 4° W.

Tidal Signals are exhibited at the signal station near the lighthouse, as at Rokuren lighthouse (see the Addenda for page 790).

At $1\frac{1}{2}$ mile westward of He saki is the village of *Tanoura*, where it has been proposed to construct a dry dock. About one-third of a mile eastward of the village is the landing place of several *telegraph cables*, which here cross the strait.

Kanju sima is 86 ft. high, and *Manju* 188 ft.; at 2 to 3 cables southward of Manju is a bank with 4 fathoms least water, on the eastern end of which is a *black buoy*, bearing a *fixed bright light*.

Naka no su or *Middle Ground* is now marked by a *red buoy* No. 1, in 6 fathoms off its N.E. extreme, bearing an *occulting bright light*, eclipsed for 2 *seconds* in every 6 *seconds*. At 2½ cables S.W. ½ S. from this is *red buoy* No. 2, in 4½ fathoms, bearing a similar *occulting red light*. The former *red* and *black* buoys are removed.

Tobiga su are some shoal patches of 2¾ to 3 fathoms, southward of the western part of Naka no su; their northern part is marked by a *red buoy*, bearing an *occulting bright light*, eclipsed for 2 *seconds* in every 6 *seconds*. At 1⅓ cable N.W. ½ W. from this is a *black buoy*, bearing a *fixed bright light*, and between them is the narrowest part of Middle Channel.

Page 793.—*Tano Bank*, or *Kaki no Tsuji*, has 1¾ to 3 fathoms over it.

Kanabuse is now marked by a stone *beacon* tower 45 ft. high, *black* and *red bands*, bearing an *unattended fixed bright light*, at 27 ft. above high water, visible 6 miles. (The *buoy* has been removed.) Within this are several detached patches of 2¼ to 3 fathoms, as shown on the chart.

A *black buoy*, bearing a *fixed red light*, lies close to a sunken 5-ft. rock on the shore bank, at 3¼ cables North of Kanabuse beacon.

Dan no ura Light.—At 7 cables N. 88° W. from Kanabuse beacon is a hexagonal wooden structure 44 ft. high, *red* and *white bands*, showing a *fixed bright* light, elevated 52 ft., and visible 6 miles; it is shown southward between N. 59° E. and S. 30° W.; obscured thence over Moji Shoal to S. 42° W.; and visible thence over the fairway to S. 46° W.

Nagamura Lights.—On Maru yama, at 1 mile S.W. by W. of Dan no ura light beacon, is a square white wooden tower 15 ft. high, showing a *fixed red* light, elevated 65 ft., and visible 10 miles over an arc between N. 60° E. and N. 70° E. On the beach, 162 yards to N. 65° E., is a white iron tower 46 ft. high, showing a *fixed bright* light, elevated 40 ft., and visible 6 miles. Both lights burn *unattended*, and in line, bearing S. 65° W., lead through the fairway of North Channel, from abreast Kanju sima.

North Channel, or *Kita suido*, has a least depth of 26 to 27 feet, in the fairway eastward of Middle Ground.

Middle Channel, or *Chuo suido*, has shoaled considerably, and now has a least depth of 22 ft., between the lighted buoys; Dan no ura and Kanabuse light beacons in line, N. 88° W., lead through in 3¼ fathoms least water. *Hino yama* is 860 ft. high.

South Channel, or *Minami suido*, has 5 fathoms, but is not buoyed.

Moji or Mozi saki terminates in a low hill; the hill over it is 562 ft. high. The *buoy* marking the telegraph cable has been removed.

Whitshed Bay is now known as *Moji ko;* see the Addenda for page 792.

Pages 793-795.—**Directions**.—The navigation of Simonoseki Strait has been much simplified by the establishment of the lighted buoys and beacons above described, and the route is marked on the chart.

Page 795.—**Moto yama**.—The *red buoy*, marking the extremity of the spit off Mi saki, has been replaced by a *black buoy*, bearing an *occulting bright light*, eclipsed for 4 *seconds* in every 9 *seconds*.

Hime sima Light.—On the eastern extreme of Hime sima is a white stone tower 31 ft. high, showing a *four-flashing bright* light, the four flashes occupying 21 *seconds*, and then an interval of 21 *seconds*; it is 183 ft. above high water, and visible 20 miles, except where obscured by the land.

Page 796.—**IYO NADA**.—*Ya sima* is 946 ft. high in its southern part; *Ko Minasi* 403 ft. high; and *Minasi* 759 feet. *Yuri sima* is 628 ft. high at its eastern end.

Mitsuga hama is connected with *Matsuyama*, 4 miles inland, by railway, and also with *Gun-chu*, on the coast to the southward. A *fixed bright light*, elevated 29 ft., and visible 9 miles, is shown from a white wooden tower on the North pier at Mitsuga hama.

Tsuru sima Lighthouse is a white tower, 400 yards within the N.W. point. The light is visible between S. 15° W. and N. 79° E.

MISIMA NADA has now been accurately surveyed by the Japanese.

Hirosima, with about 120,000 inhabitants, is, next to Osaka, the most important commercial centre of the Inland Sea. The anchorage off it, named *Ujina ko*, can be reached by vessels of the largest size. It is connected with the railway and telegraph systems. Several lights are exhibited in the approaches from the Iyo Nada and Misima Nada, as shown on the chart. It is high water at Ujina, southward of the town, on full and change, at 9h. 50m.; springs rise 13¼ ft., neaps 8¼ feet.

On the N. W. side of *Itsuku Island*, to the S. W. of Hirosima, is a famous temple, the resort of numerous pilgrims.

KURE is a naval dockyard and arsenal in *Yamada Bay*, 7½ miles south-eastward of Hirosima, and there is secure anchorage off it for vessels of the largest size, but no

vessel is allowed to enter without permission. There are two dry docks, the larger one being 476 ft. long, with an entrance 92 ft. wide, having 36 ft. over the sill at high water springs. A larger dock is under construction. Repairs can here be executed for hull and machinery, and coal is stored in large quantities; fresh provisions and water may also be had.

Time Signal.—A red ball is hoisted 5 minutes before noon, and dropped at noon Japanese standard time, equivalent to 3h. a.m., G.M.T.,

Page 797.—**The BINGO NADA** is about 30 miles in extent, and 25 miles wide.

Kurusima no seto.—On *Ko no se* stands a red stone *beacon*, on which is shown an *unattended fixed* light, elevated 27 ft., and visible 6 miles; it shows *red* over the shoals between S. 87° W. and N. 51° W., and *bright* elsewhere.

Nagato sima is 217 ft. high, and on its N.W. point stands a white tower 25 ft. high, showing a *fixed bright light*, elevated 126 ft., and visible 6 miles westward between S. 31° E. and N. 86° E.

The conspicuous hill, with a double summit 1,202 ft. high, is 5 miles south-eastward of Imabari.

Page 798.—**Obama** is a seaside resort of Europeans.

Lights.—On a hill half a mile southward of Obama is a white tower 41 ft. high, showing a *triple-flashing bright* light, three flashes in 8 *seconds* followed by an interval of 12 *seconds*; it is elevated 114 ft., and visible 16 miles. At the base of the tower a *fixed red* light is shown at an elevation of 73 ft., between N. 69° E. and N. 74° E., this sector covering the rocks off the South end of Osima.

Tides.—It is high water in Kurusima no seto at 10h. 19m.; springs rise 13½ ft., neaps 9 feet.

Pages 798-799.—The navigation of the *Northern Route* to the Bingo Nada, by way of *Aogi seto* and *Mekari seto*, has been facilitated by the establishment of several buoys, beacons, and leading lights, as shown on the chart.

Oge sima Light.—On the S.W. extreme of Oge sima stands a white stone tower 25 feet high, showing a *flashing bright* light every 20 *seconds*, elevated 111 ft., and visible 16 miles westward from South to N. by E.

Itozaki, or *Matsuhama*, on the eastern shore of Miwara Bay, is an open port, with good anchorage off it in 5 to 10 fathoms. It is 144 miles distant by railway from Kobe.

Page 799.—**Hi-uchi Nada.**—*Mino sima*, the southern *Shi-shaka Island*, is 381 ft. high, and has a conspicuous domed building on its summit; *Iye sima*, its northern part, has some buildings and three chimneys on it, belonging to a copper refinery. *Soniobandar Rock*, which uncovers, lies 1 mile S. 60° E. from the summit of Mino sima.

Page 800.—*Toyo Island* is 363 ft. high, and has a white tripod *beacon* on its summit. *Takaikami* is 890 ft. high. *Oki* is about 586 ft. high, and has a *beacon* on its summit. *Yeno* is 471 ft. high. *Mata* is 289 ft.; *Momo*, 209 ft.; and *Ibuki*, 406 ft. high.

Hyakkan jima Light.—On the western side of Hyakkan, the islet in the centre of the eastern approach to the Mekari seto, stands a white stone tower 25 ft. high, showing a *flashing bright* light every 20 *seconds*, elevated 240 ft., and visible 16 miles.

Hasiri Island is 496 ft. high, and *Udsi*, 383 feet.

In the S.W. angle of the Bingo Nada is the town of *Niihama*, the port of shipment for the copper-ore brought down by railway from the mines at *Besshi;* the refinery is at Shi-shaka sima.

At *Habu* is a dry dock 300 ft. long, with an entrance 39 ft. wide, having 13½ ft. over the sill at high water springs.

Directions.—After passing the rocks lying off the South end of O sima, haul up to E. by N. ½ N. to pass northward of Kadji.

Akeno misaki.—*Shiwoonde yama* is 1.205 ft. high.

St. Vincent Channel, or *Shiako seto.*—*Kawara zu*, the shoal bank extending 3 miles eastward from Sanagi Island, is marked by a *black bell buoy* on its S.E. side. *Oki no su*, or *Conqueror Shoal*, has a *red bell buoy* off the northern side of its western part.

Habushi iwa Light.—On the summit of the rock stands a *beacon* tower, *red* and *black bands*, bearing an unattended *fixed bright* light, elevated 33 ft., and visible 6 miles.

Nabe sima Lighthouse is 21 ft. high, and the light visible 15 miles, except where obscured by land.

Oki sima Light.—On the North point of Oki sima, in the eastern part of St. Vincent Channel, stands a white stone tower 41 ft. high, showing a *flashing* light every 15 *seconds*, elevated 48 ft., and visible 12 miles. It shows *green* over Naka se Shoal between S. 56° W. and S. 77° W.; *bright* thence over the fairway to S. 85° W.; *red* thence over Galatea Shoal to N. 84° W.; and *bright* thence to S. 74° E.

Tadotsu is connected with *Takamatsu* by railway; the latter port has a considerable coasting trade.

Page 804.—*Okoyama* has about 50,000 inhabitants, and the railway to Kobe passes near it.

Shikama, about 6 miles eastward of Itsu Bay, is connected with the railway by a branch line. On the wharf stands a white wooden tower 23 ft. high, showing a *fixed bright light*, elevated 34 ft., and visible 6 miles.

At 7 miles south-eastward of Shikama is *Takasago*, where a small *fixed bright light* is shown.

Page 804.—**Ye saki Light** shows a *red* sector over Shika no se, between S. 83° W. and N. 79° W.

Akashi Strait.—The *buoy* off the southern side of *Shika no se* is *black*.

Page 805.—*Tides.*—It is high water in Akashi Strait, on full and change, at 8h. 33m.; springs rise 4¼ ft., neaps 2¼ ft., but subject to the wind. The tidal streams run from 3 to 5 knots.

Hira iso is marked by a black *beacon* tower 52 ft. high, bearing an *unattended fixed red light*, elevated 39 ft., and visible 6 miles. The *buoy* is removed. Telegraph cables cross Akashi Strait westward of the beacon.

Pages 805-806.—**OSAKA**, the Venice of Japan, is intersected by canals in all directions. It has largely increased of recent years, being now the centre of a great cotton manufacturing industry, and contained 1,068,771 inhabitants in 1905. It is connected with the railway system, which has been so largely extended, and there is regular steamer communication with all parts of the Empire. In 1905, the vessels entering numbered 591, with a tonnage of 399,426. The imports in that year, chiefly sugar, grain, woollen goods, machinery, and metals, were valued at £1,888,524; and the exports, cotton manufactures, metals, provisions, and matches, at £5,710,358.

Consequent upon the great increase in commerce, it became necessary to improve the accommodation for shipping, and this has been carried out by the construction of two long moles, reaching 1⅔ mile off shore, and enclosing an area of 144 acres, with depths of 5 fathoms and under, at cost of about £2,500,000; it has been used by vessels up to 6,000 tons. The wharves are provided with all necessary appliances, and the railway is brought down to them. It is intended to dredge the harbour to a minimum depth of 28 ft., and the course of the *Agi kawa* has been diverted northward, so as to avoid silting.

The shipbuilding and engineering works can build or repair vessels and machinery of considerable size. The largest dry dock is 250 ft. long, with an entrance 50 ft. wide, with a depth of 11 ft. over the sill. Coal and other supplies may be had.

Page 806.—**Lights.**—On the extremity of the northern breakwater is a white iron tower 25 ft. high, showing a *fixed bright* light, elevated 45 ft., and visible 9 miles. On the extremity of the southern breakwater is a similar red tower, showing a *fixed red* light, visible 7 miles.

On the western jetty at *Amagasaki gawa*, 3 miles northward of the harbour, is a white column 33 ft. high, on which is shown a *fixed bright* light, visible 3 miles.

It is high water off the harbour, on full and change, at 7h. 30m.; springs rise 5¾ feet.

The Kishu gawa entrance is now bounded on the North by the inner part of the southern jetty of the harbour. On the southern pier is a tower 29 ft. high, black and white bands, showing a *fixed red light*, visible 8 miles.

Pages 807-808.—**HIOGO and KOBE** may now be considered as one city, since the abolition of the foreign settlement, and the great increase of the population engaged in its manufacturing industries. In 1905, the inhabitants numbered 322,131, including about 1,200 Europeans. It is now the chief port of Japan, the vessels entering in 1905 numbering 2,643, with a tonnage of 4,858,267. In that year the imports, chiefly cotton (worth £9,095,454), grain, metal, cotton and woollen goods, manures, chemicals, oil, and provisions, were valued at £23,337,678; and the exports, cotton goods, matches, provisions, matting, straw plait, tea, and earthenware, at £8,621,823. There is regular steamer communication with all parts of the world.

Notwithstanding the enormous increase in the commerce of Kobe, its merchants have made no attempt to provide proper harbour accommodation, though the wharf and warehouse facilities have been largely increased to suit the large vessels now frequenting the port. It was proposed to construct breakwaters, enclosing an area of 560 acres, with depths of 24 to 30 ft. alongside new wharves, and a commencement is about to be made; the cost was estimated at £2,500,000. With bad weather from the East, communication with the shore is difficult.

There are shipbuilding and engineering works, capable of building and repairing vessels and machinery of large size. There is a pontoon dock 412 ft. long, and 60 ft. wide, with 20 ft. on the blocks, capable of lifting weights up to 7,000 tons. The Kawasaki dry dock is 425 ft. long, with an entrance 63 ft. wide, having 24 ft. over the sill, and it is proposed to construct a much larger one, about 700 ft. long. There are two patent slips, the larger one available for vessels up to 2,000 tons. A steam-tug can be had if required.

Japanese coal is stored here in large quantities, but English coal is usually scarce; it is brought off in lighters. Fresh water and ballast are also brought off in boats, and fresh provisions are plentiful and moderate in price. There is a hospital and seamen's institute.

Page 808.—*Time Signal.*—A red ball is hoisted above the tower of the Port Office at 5m. before noon, and dropped at noon, Japan time (meridian of 135° E.), equivalent to 3 a.m. G.M.T., when a gun is also fired. If inaccurate, Code flag W will be hoisted at the yard-arm. Lat. 34° 41′ 10″ N., long. 135° 10′ 48″ E.

Lights.—*Wada no misaki* light is obscured over Akashi Strait northward of S. 73° W. The *green* light on the eastern pier is discontinued. Only small lantern lights are shown on the piers.

Vessels anchor off Kobe as convenient, but are exposed to easterly winds. The limits of the port are marked by two pairs of pole beacons, on Wada no misaki and Waki no hama. Within these lines vessels are assigned positions by the harbour-master, according to size, etc., and there are mooring buoys for their use. In the typhoon season, steamers are advised to be ready to put to sea at short notice. The quarantine vessel lies off Wada no misaki, and all vessels are here boarded by the health officers before entering.

Directions.—Sailing vessels bound to Kobe from the South, in winter, are often delayed in Kii Channel by stormy northerly winds, and are then advised to keep over eastward of the fairway. Care is also necessary to avoid the fleets of fishing vessels. In approaching Kobe, two high chimneys westward of Wada no misaki form good marks, and at night the glow of the city lights is visible afar off. Pilots and tugs will usually be found in Kii Channel.

Capt. Wurthmann, ship *Erik Rickmers*, advises sailing vessels bound southward to anchor off the western shore of the Gulf of Osaka, if impeded by southerly winds, so as to have an opportunity of getting through Isumi Strait, should the wind change to N.W. or West. They should also not await a favourable wind at Kobe in summer, as it may change before they reach the strait.—(*Annalen der Hydrographie*, 1899, *page* 169.)

Yokoya, 6 miles eastward of Kobe, is a landing place for petroleum; vessels lie in the open roadstead, and land their cargo, or ship ballast, by means of lighters.

Sumoto, 6 miles northward of the S.E. point of Awadji Island, has a pier, on which a small *fixed bright light* is shown, visible 4 miles.

Page 809.—**Tomangai Lighthouse** is painted white; the light is elevated 194 ft., and visible 17 miles.

Yura.—The bluff hill on the North point of the island is 200 ft. high.

Noma or *Nu sima* is 365 ft. high.

KII CHANNEL is 12 miles wide at its entrance, between Hino misaki and I sima, within which it increases to about 20 miles.

Page 810.—**NARUTO PASSAGE.**—It is high water at Fuk ura, on full and change, at 6h. 54m.; and at Anaga ura (northward of To saki) at 11h. 41m. The South going stream begins at 3h. 25m. after the moon's meridian passage at springs, and 2h. 8m. after at neaps.

Page 811.—**Tokusima** had about 64,000 inhabitants in 1904, and has railway communication with the interior.

I sima is 385 ft. high. The rock reported by Capt. Hummel has not since been seen; it was searched for in vain by the French war-vessel *Roland* in 1886.

Tachibana ura, the bay W.N.W. of I sima, is encumbered with rocks and shoals, but affords anchorage in 6 to 9 fathoms, off the town on its northern shore. *Tsubakitomari ura* is an inlet on the South side of the bay, with well sheltered anchorage in 10 to 12 fathoms, sand and mud.

Between Tachibana ura and Naruto Passage, the eastern coast of Shikoku is mostly flat and richly cultivated, formed by the deltas of several shallow rivers, fronted by a shoal bank.

Komatsushima or Wadasima Harbour affords sheltered anchorage in 4 fathoms within *Wadabana*, its low wooded eastern point. *Okame se* or *Johnston Rock* dries 3 ft. at low water, and *Okise*, of 2¼ fathoms, lies 1¾ mile E. by N. ½ N. from it.

Hachken or Kino gawa.—*Waka yama* is now a considerable town, connected with Osaka and the interior by railway.

Page 812.—**Miya saki**, 3 miles south-westward of Osaki Bay, is 263 ft. high, and has a sunken rock lying half a mile South of it.

Tskahara Bay, or *Yuasa wan.*—*Sono se*, with 4 fathoms over it, lies nearly midway between Taka sima and *Oba se* or *Golden Rock*, which lies S. by E. ¼ E. from Miya saki. *Sung-ami* or *Sogami se* lies 2 miles N. ¾ E. from Taka sima.

Sirasai saki.—*Ashika jima* or *Fisherman Rock* is 10 ft. high.

Pages 812-813.—**Ura no Uchi** affords sheltered anchorage in 6 to 7 fathoms, mud.

Page 813.—**HINO MISAKI.**—The saddle hill is 1,109 ft. high.

The Lighthouse on Hino misaki is a white iron tower 35 ft. high, showing a *flashing bright* light every *half-minute*, elevated 261 ft., and visible 23 miles seaward between S. 65° E. and N. 4° W.

Hidaka kawa.—*Nosima*, *Katsuo jima*, or *River Reef*, is 12 ft. high.

The extremity of the reef off Arari Point bears S.E. by E. ¼ E. from Ilibe saki. The hill North of Arari Point is 724 ft. high.

TANABE BAY, 17 miles S.E. of Hino misaki, is encumbered with rocks and shoals, found during the Japanese survey in 1900. There is a conspicuous square red chimney at the town.

Pages 815-816.—**OO SIMA HARBOUR.**—Large vessels enter by the southern channel. *Kami seh* has 2¼ fathoms over it. *Kuro sima* is 163 ft. high, and wooded; *Hako sima*, the highest of the rocks half a mile S.S.E. of it, is 25 ft. high. It is high water in the harbour, on full and change, at 6h. 15m.; springs rise 7 ft., neaps 4¼ feet.

Page 817.—**URA KAMI HARBOUR.**—A pinnacle rock of 3¼ fathoms, with 10 fathoms around, lies in the entrance, over half a mile S.E. by E. ½ E. from Tateishi or Hive Rock.

Kantori saki or Arundell Point Lighthouse is a square white tower 15 ft. high, showing a *fixed bright* light, elevated 117 ft., and visible 8 miles.

O sima, the rock off Kantori saki, is 31 ft. high. *Naminori Rock*, awash at high water, lies 3¼ cables S.E. ¾ S. from the lighthouse.

Kats ura.—Numerous rocks were found in the harbour and its approach during the Japanese survey in 1901.

Otonashi River debouches in lat. 33° 44′ N., and the white towers of the ruined castle of *Singo* are conspicuous from sea. Coal and timber are exported.

Page 818.—*Kinomoto*, at the North extreme of the shingle beach, has good anchorage off it, in 9 fathoms, sheltered from northerly and westerly winds.

OWASI BAY.—It is high water, on full and change, at 6h. 6m.; springs rise 7 ft., neaps 4½ feet.

Page 819.—**Taskara ura.**—*Tokiu san Peak* is 1,950 ft. high.

Mura Harbour.—A 3½-fathoms rock lies in the entrance, 4 cables N. 65° W. from Tarso saki, the eastern point. The clumps of trees are on two hills, 654 and 685 ft. high. *Gokasho*, the eastern arm, has depths of 8 to 10 fathoms, mud. A 9-ft. sunken rock lies 2 cables West of Kadzura sima.

Goza Harbour is encumbered with numerous dangers, and must be entered with great caution. Neap tides rise 4¼ feet.

Pages 819-820.—**Kami sima** or *Outer Reef* has a rocky 15 ft. shoal at one-third of a mile W.S.W. of it. *Jenje yama* is 1,346 ft. high.

Page 820.—**Toba.**—There is a dry dock here 247 ft. long, with an entrance 42 ft. wide, having a depth of 13½ ft. over the sill.

Page 821.—**Minato gawa.**—At 3 miles from the entrance is the town of *Yamada*, with about 30,000 inhabitants, connected with the railway system, and here are the famous temples of Ise, much resorted to by pilgrims.

Momotori sima is better known as *Tafushi*.

Several sunken rocks have been found in the channel between Suga sima and Oki no se Reefs; the S.W. patch, with 9 ft. over it, lies 1¾ mile N. 62° E. from Suga sima lighthouse.

Irako saki is 272 ft. high. The channel between it and the rocks off Kami sima is very deep, and about 1½ mile wide, forming the best channel for entering or leaving Owari Bay. A 9-ft. shoal lies 8½ cables N. 83° E. from the North extreme of Kami sima, and a 10½-ft. shoal 6¾ cables S. 85° E. from the East extreme.

Page 822.—**OWARI BAY.**—In the western angle, in lat. 34° 43′ N., is the town of *Tsu*, situated on the railway. A *fixed bright light*, visible 6 miles, is shown on the eastern pier at the river entrance. Telegraph cables connect it with Noma, on the eastern shore, their position being marked by a *red beacon buoy*, 1 mile N.E. of the light.

YOKKAICHI, on the N.W. shore of Owari Bay, is situated on the railway, and carries on a considerable trade. There is anchorage 1 mile off shore, in about 5 fathoms, mud, with the lighthouse bearing W.N.W., but small craft lie closer in. Southerly and S.E. winds send in a heavy sea. It is high water here, on full and change, at 6h. 30m.; springs rise 7 feet.

Light.—Near the inner end of the mole is a white wooden tower 30 ft. high, showing a *fixed bright* light, elevated 42 ft., and visible 8 miles.

NAGOYA is a city of nearly 300,000 inhabitants, situated on a fertile plain, and is a busy commercial and industrial centre, with manufactures of porcelain, pottery, &c. The railway passes near it, and a branch line runs to Atsuta.

Atsuta Harbour.—Consequent upon the increase in the commerce of Nagoya, harbour works have been undertaken, to render the port accessible to larger vessels. Two long moles are under construction, to enclose a harbour with an area of over 100 acres, which will be dredged to a depth of about 25 ft. at low water. The cost is estimated at about £200,000.

Light.—A *fixed red* light, elevated 28 ft., and visible 4 miles, is shown from a white wooden house on reclaimed ground in Atsuta Bay.

Mikawa Bay has regular depths of water, decreasing from 10 fathoms at the entrance. *Tono se* is a dangerous detached rock of 2½ fathoms, lying in the middle of the approach, at 1⅓ mile S.S.E. from No sima. The eastern angle of the bay is known as *Atsumi Bay*, and the railway runs along the North shore, passing by the town of *Toyohashi*, 3 miles up the river running into the head of the bay.

Chita Bay, to the N.W. of Mikawa Bay, is fronted by a range of islets and rocks, westward of which is the deep but narrow entrance; a *red beacon* stands on *Kado ishi*, the western rock. The bay has depths of 9 fathoms and under, between the shore banks on either side, and on the western shore, 9 miles from the entrance, is the town of *Taketoyo*, the terminus of a branch railway from the main line; there is anchorage in 5 fathoms, three-quarters of a mile E. by S. from the pier, but farther northward the bay becomes very shallow.

Hamana ko.—The railway crosses the entrance.

Light.—On the beach N.E. of the *Tenriu gawa* stands a white iron tower 48 ft. high, showing a *fixed bright* light, elevated 55 ft., and visible 8 miles.

Page 823.—**OMAI SAKI Lighthouse** is in lat. 34° 36′ N., long. 138° 14′ E.; at 2¼ miles westward of it is a 2¾-fathoms rock, 3 cables off shore, and a 3¾-fathoms patch lies about half a mile south-westward of this.

SURUGA GULF.—The Japanese survey shows a bank of less than 100 fathoms, in the middle of the entrance, the shoalest part being a patch of 18 fathoms, at its northern end, 17 miles N.E. by E. ½ E. from Omai saki lighthouse.

Page 824.—**FUSI YAMA** was last in eruption in 1707.

SHIMIDZU HARBOUR.—The railway here runs along the shore, and skirts the head of the gulf. Tea is the principal export. There are three conspicuous chimneys near the town. It is high water at Shimidzu, on full and change, at 6h. 8m.; springs rise 6 ft., neaps 3¾ feet.

Yenoura is said to be an indifferent anchorage, and the channel eastward of Ara sima is closed by permanent fishing nets.

Pages 825-826.—**IRO SAKI.**—*Katsuwo sima*, 1 mile West of the cape, is 67 ft. high.

Page 826.—**ROCK ISLAND LIGHTHOUSE** is white with two black bands.

Yoko ne.—The largest rock is about 47 ft. high.

Page 827.—**SIMODA HARBOUR.**—*Inuhashiri jima* or *Centre Island* is 148 ft. high, and a 1¾-fathom rock lies nearly 2 cables N. 24° E. from the summit.

Oonagare Rock has 1¾ fathom over it.

Page 829.—**Manatsuru Promontory.**—The off-lying rock is 50 ft. high.

Hatsu or *Ha sima* is 171 ft. high.

Atami Bay.—Sunken rocks extend about 2 cables off Uomi saki, the South point.

Page 830.—**Macedonian Reef.**—*Kamegi Shoal*, of 1¼ to 2½ fathoms, lies about 1¼ mile W. ½ S. from Macedonian Reef, on the shoal extending off the southern point of *Asina* or *Kotawa Bay*.

Page 831.—**NOSIMA SAKI Lighthouse.**—In foggy weather, an *explosive* signal is fired every 15 *minutes*.

Mera or Mela Head is 3¼ miles westward of the lighthouse, and has a *Signal Station* on it; it is 483 ft. high.

Tateyama Bay.—*Shira ne*, a rocky patch of 2 fathoms, lies half a mile southward of Daibo saki.

Page 832.—*Tsubune*, with 3 ft. least water over it, lies 4 cables southward of Kanaya or Miogane Point.

Pages 832-833.—**Directions.**—Along the S.E. coast of Japan, the wind generally follows its direction, blowing from the North down the large gulfs, and becoming either East or West along the intervening coast. At times there is a considerable indraught towards the coast between Oo sima and Mikomoto or Rock Island; this occurs generally during or after easterly winds, and especially during the S.W. monsoon season. Several vessels have been lost owing to this.

Page 833.—**Tsurugi saki,** or *Cape Sagami* (page 829), rises in table-topped hills about 150 ft. high. The lighthouse on it should not be approached within a mile, to avoid the foul and uneven ground around it.

Ashika sima or *Plymouth Rocks*, are 8 and 10 ft. high, and on them stands a *beacon, red* and *white bands*, with a ball.

Page 834.—**URAGA.**—The lighthouse on Tomio saki is disused. The harbour is nowhere more than a cable in width, and is buoyed. There are shipbuilding and engineering works here, where repairs can be executed for vessels and their machinery. There are two dry docks, one 479 ft. long, with an entrance 68 ft. wide, having 23 ft. over the sill; and the other 451 ft., 62½ ft., and 24 ft. respectively. It is high water here, on full and change, at 6h. 21m.; springs rise 6½ feet.

Kannon saki is partially wooded, and the conical hill over it is 258 ft. high. The *light* is visible 17 miles, and shows *bright* eastward between N.N.W. and S. ¼ W.; *red* thence to S. by W. ½ W., over Plymouth Rocks; and *bright* thence to S.W. ¾ S. The lower *red* light is discontinued.

Fort No. 3 has been constructed in the centre of the fairway, nearly midway between Kannon saki and Fort No. 2 on the extreme of Futsu saki spit. To pass clear of the foundations of Fort No. 3, vessels must not approach within 2 cables of its North and West sides, nor within 3 cables of its South and East sides. A *fixed red light*, elevated 66 ft., and visible 6 miles, is shown from a white mast above the fort.

Fort No. 2 stands on the western extreme of the spit extending from Futsu saki, and is connected with Yokoska by a submarine telegraph cable. A *fixed bright light*, elevated 53 ft., and visible 6 miles, is shown from a white mast above it. *Fort No.*1 is on the spit, 1⅛ mile within Fort No. 2.

Caution.—Many vessels have grounded on Futsu saki spit, owing to careless navigators having mistaken Fort No. 2 for Fort No. 3.

Saru sima is 138 ft. high.

Page 835.—*Sakune Reef*, 3½ cables N.E. by E. from Katshiriki, is not marked by a beacon, but a *buoy* marks the North side of a 1¾-fathom patch 1 cable to N.E.

YOKOSKA HARBOUR is connected with Tokio by railway. *Ha sima* is 44 ft. high. *Azuma* is 394 feet. The bay is connected with F'ka ura by two canals, for torpedo boats and other small vessels. There are now three dry docks, and a larger dock is under construction, with 32 ft. over the sill. At present the largest is 513 ft. long, with an entrance 93 ft. wide, having 28 ft. over the sill at high water. It is proposed to improve the harbour by the construction of breakwaters.

Page 836.—**F'ka ura,** or *Nagahama*, is used as a torpedo depot and quarantine station, the latter being provided with proper appliances for the disinfection of ships, crew, etc.

Shoal water and foul ground extend more than a mile eastward from *Natsu sima*, the extremity being marked by a *red* beacon *buoy*. In April, 1907, a *red whistle buoy* was experimentally placed in 6 fathoms, on the South side of *Okino ne Reef*, at 2 miles S.E. by E. ½ E. from Koshiba saki or Fillmore Point.

Tomioka Anchorage.—A *conical black buoy*, with staff and *cylinder*, lies north-westward of *Igai ne*, and over 1¾ mile N.E. by E. ⅜ E. from Koshiba saki. A *conical red buoy*, with staff and *triangle*, lies south-eastward of *Naka ne*, and nearly 1⅜ mile N.E. ½ E. from Koshiba saki. A *conical red buoy*, with staff and *triangle*, lies southward of *Koga ne*, and over 1⅛ mile N. by E. ⅞ E. from Koshiba saki.

A *measured mile* is marked by buoys and beacons off the coast southward of *Graham Bluff*.

Mississippi Bay is connected with Yokohama by a boat canal. The extremity of the shoal extending 1 mile off Treaty Point is marked by a *black* beacon *buoy*. The *red buoy* N. by W. of Mandarin Bluff has been removed. *Mandarin Bluff*, or the *Hills*, has numerous European villas on it.

Honmoku Lightvessel lies in 6 fathoms, 1⅛ mile N.E. ½ E. from Mandarin Bluff. The quarantine vessel lies about half a mile northward of it.

Pages 837-838.—**YOKOHAMA,** the chief centre of European trade with Japan, has greatly extended of recent years, and has now joined up with Kanagawa; at the end of 1906, the population numbered 359,862, including 6,045 foreigners. It is connected with Tokio by railway and electric tramway. In 1906, the imports were valued at £15,217,598, chiefly cotton and woollen goods, rice, metals and machinery, sugar,

petroleum, chemicals, and leather; the exports, £20,503,173, consisted principally of silk (£15,862,935), tea, metal goods, fish, chemicals, and cotton goods. The vessels entering numbered 1,107, with a tonnage of 3,262,442. Numerous lines of steamers connect it with the principal ports of the Empire and the world, and the railway, telegraph, and telephone systems have been been widely extended. The restrictions as to the movements of Europeans have been removed.

The city is now provided with a supply of good water, brought by aqueduct for a distance of 28 miles, and there are hydrants for the use of shipping on the floating landing stage. Coal, both Welsh and Japanese, is stored here in large quantities, and can be supplied at the wharves or in lighters. Ballast may be had, if required, and the services of steam-tugs are also available.

On the western shore of the harbour are some large engineering works, where repairs can be executed for vessels and their machinery. There are three dry docks, No. 1 being 503 ft. long, with an entrance 93½ ft. wide, having 29½ ft. over the sill; No. 2. 400 ft., 60½ ft., and 27½ ft.; No. 3, 541 ft., 85 ft., and 31 ft., respectively. Floating sheers will lift weights up to 35 tons.

Harbour.—Yokohama Bay being exposed to easterly winds, a spacious sheltered harbour has been formed by the construction of two long low moles or breakwaters enclosing the head of the bay, the entrance being 1⅛ cable in width. In the outer part the depth is about 32 ft. at low water, and dredging is in progress to deepen the inner part. A substantial iron pier extends from the English hatoba into a depth of 26½ ft., and is reserved for liners; it is provided with cranes, lifting up to 15 tons, and lines connect it with the warehouses and railway. To the N.W. of this pier an area of about 56 acres is now being reclaimed, for the construction of deep-water quays and warehouses, for the accommodation of vessels of the largest size, and provided with powerful cranes and connected with the railway. At present ordinary vessels lie at moorings, and load or discharge cargo by means of lighters, which may be prevented when the wind blows strongly between N.N.E. and S.S.W.

Lights.—On the extremity of the southern breakwater is a white iron tower 40 ft. high, showing a *fixed bright* light; and on the extremity of the northern breakwater is a similar red tower, showing a *fixed red* light; both lights are elevated 41 ft. above high water, and visible 6 miles.

A small *fixed green* light is shown on the end of the iron pier. The *red* light at the English hatoba has been discontinued.

Time Signal.—On the eastern or French hatoba is a white mast, on which a black ball is hoisted at 11h. 55m., and dropped at noon, mean time of the meridian of 135° E., equivalent to 3h. a.m., G.M.T. It is in lat. 35° 26′ 41″ N., long. 139° 39′ 0″ E. The signal is not made on Sundays or holidays, and if inaccurate the Code flag W is hoisted. In May, 1907, the officers of the U.S.S. *West Virginia* reported this signal to be wholly unreliable.

Storm, *Wind*, and *Weather Signals* (see Addenda for page 781) are made on a tall mast at the inner end of the iron pier.

Climate.—Observations taken during three consecutive years at Yokohama, show that the prevalent winds are from North, and those chiefly from September to March; from May to August S.W. winds are frequent. The thermometer ranged between extremes of 20° F. in February and 94° in August. There are about 8 or 10 snowy days in winter, but fog is only met with from April to November, and then averaging only 11 days altogether.

Page 838.—*Anchorage.*—The harbour limit is bounded by a line drawn from Mandarin Bluff to the lightvessel, and thence due North to the coast. Vessels are forbidden to anchor in the approach to the harbour, between lines extending half a mile East of the breakwater lighthouses, the area southward of this being reserved for war-vessels, and that northward of it for sailing vessels over 300 tons and vessels with explosive or dangerous cargo. No vessels, unless regular mailboats, are allowed to enter the harbour at night, and in bad weather anchorage signals will be made from the lightvessel to vessels coming in.

Vessels entering must first undergo examination by the Health Officer from the quarantine vessel, who will only attend during daylight. The quarantine station is at Nagahama.

Tides.—It is high water in the bay, on full and change, at 5h. 30m.; springs rise 7¼ feet, neaps 4¼ feet. At springs, the streams run from 2 to 3½ knots an hour in the entrance channel between Kannon saki and Futsu saki.

Pilots are stationed near Sagami mi saki, northward of Tsurugi saki, and will come off to vessels signalling for them, should they not all be engaged. Pilotage, however, is not compulsory, and there is no difficulty in the navigation.

Page 838.—**Kawa saki.**—The *buoy* marking the S.E. edge of the shoal is *black*. The *light* is now *occulting bright*, being eclipsed for 7 *seconds* once in every *half-minute*, and visible 11 miles.

The route of the *telegraph cable* in *Shinagawa Bay* is marked by truncated conical buoys.

TOKIO is connected with the railway system, and has largely extended, the population in 1904 numbering 1,818,000. The harbour accommodation has been improved, but at present there is a depth of only 7 ft. at low water in the approach to the Shibaura basin. Here is a shipbuilding yard, where repairs can be executed for vessels and their machinery. The dry dock is 270 ft. long, by 35 ft. wide, with 14 ft. over the sill at high water springs.

Works are now in progress to construct a harbour for the accommodation of the largest vessels, at a cost of about £6,000,000. An outer harbour will be formed by two breakwaters, about 1 mile northward of Kawa saki lighthouse, and dredged to a depth of 34 feet. Thence a canal, 5½ miles in length, and 32 ft. deep at low tide, will be dredged to the present Shibaura basin, which will be greatly enlarged and improved, with a depth of 34 ft., so that vessels of the largest size may always lie afloat alongside the quays.

It is not intended that small vessels should use the new harbour; it is proposed to construct separate quays for their use.

Page 839.—**Iwaga saki** lies 10 miles south-eastward of Tone gawa, and at 1 mile off it is a *red* beacon *buoy*, in 6 fathoms. A similar *buoy* lies in about 8 fathoms, 1½ mile north-westward of *Bandzu hana*.

On the mud-flat, about midway between Iwaga saki and Bandzu hana, are three sets of *beacons*, and three *red buoys* lying in 5 to 8 fathoms, marking a space of 1 and 3 *measured miles*.

Futsu saki.—The extremity of *Saratoga Spit* is now marked by a fort (see the Addenda for page 834), and the *buoy* has been removed. Outside this the tidal stream runs 3½ knots an hour at springs.

Page 841.—**Directions.**—*Uki sima* is 199 ft. high.

No connected and complete survey has yet appeared of the range of volcanic islets extending 300 miles southward of Vries Island.

Page 842.—**OO SIMA, or Vries Island**, is 2,512 ft. high, and was last in violent eruption in 1878. A telegraph cable connects it with Fatsizio, touching at Nii jima and Miaki sima.

Page 844.—**Mikura** is 2,837 ft. high, the summit being near its West side.

Broughton Rock or *Kannamba*, is in about lat. 33° 29′ N., and 203 ft. high.

FATSIZIO is no longer a penal settlement. There are about 10,000 inhabitants, and supplies of beef and vegetables can be had from them.

Some rocks were shown on the chart about 12 miles southward of Fatsizio, or in about lat. 32° 50′ N., long. 140° E. In 1902, the U.S. transport *Sherman* passed over this position twice and no rocks were seen. On October 20, 1903 (at 3 a.m.), a rock 40 or 50 ft. high was seen from the transport *Thomas*, 6 miles distant, lying in about lat. 32° 44′ N., long. 139° 41′ E.; when first seen it was thought to be Bayonnaise Rocks, as observations could not be taken for 2 days before, in approaching from the West, and, Fatsizio being made shortly after, it was found that the *Thomas* had been set about 60 miles northward of her supposed position. However, this rock was not seen from the *Sherman*, which passed 2 miles northward of the given position on a clear afternoon, April 24, 1904.

Page 845.—**AOGA SIMA.**—On June 20, 1904, Capt. Reid, schooner *Okanogan*, when westward of Aoga sima, passed close to a patch of heavy breakers, about 50 ft. square; the weather was thick, but by a series of good observations the position would be in lat. 32° 19′ N., long. 139° 3′ E.

BAYONNAISE ROCKS.—On August 17, 1896, Capt. Irvins, ship *Lindisfarne*, saw heavy breakers in a position about 8 miles North of these rocks. In April, 1906, the captain of the cable steamer *Okinawa maru* observed a high column of smoke or steam rising close to the rocks.

Page 846.—**Volcano Island** must have disappeared, as it was searched for in vain by the U.S.S. *Alert* in 1880, and the Japanese war-vessel *Amagi* in 1888; a large breaker, however, was observed about 7 miles westward of Smith Island. In 1870, the island was seen from the barque *Benefactress*, at about 5 miles N.E. by N. ¾ N. from Smith Island; it was 40 ft. high, and about 100 ft. in diameter, situated on a shoal 5 to 7 miles in extent East and West, and 2 miles North and South. In the same year, dense volumes of steam and fir were observed from the barque *Jane Spiers*, about 4 or 5 miles N. by W. from Smith Island. In 1872, the officers of the U.S.S. *Lackawanna* observed smoke rising from an island in lat. 31° 20′ N., long. 139° 50′ E.

In 1902, it was reported by the captain of the Japanese vessel *Aihan maru* that a rock 2 or 3 ft. high had been observed about 26 miles S.W. by W. from Smith Island.

PONAFIDIN, or Tori shima, had a population numbering 125 in 1902, engaged in gathering guano, birds' bones, feathers, &c., the village being situated in the small bay on the northern side. In August of that year a violent volcanic eruption suddenly broke out, causing the death of all the inhabitants, the village being completely overwhelmed with ashes. The appearance of the island has completely changed, the peak having disappeared and the cove filled up. When visited a few days afterwards by the steamer *Hyogo maru*, the crater was emitting quantities of vapour, and smoke was also observed rising from the sea about 1 mile S.W. by S. from the summit (see an illustrated account in the "Geographical Journal," April, 1903, pp. 436-439).

In 1902, the captain of the *Aihan maru* reported a rock about 2 ft. high, at about 20 miles N.W. by W. from Ponafidin.

Page 847.—**Submarine Volcano.**—On March 24, 1892, clouds of steam and water were observed from the steamer *Batavia*, rising from the sea in about lat. 34° 35′ N., long. 143° 23′ E.

In 1900, the captain of the steamer *Chomei maru* reported the existence of a reef, about 7 yards in extent, with 10 to 15 ft. over it, in about lat. 34° 4′ 45″ N., longitude 141° 15′ 45″ E.

Page 847.—**East Coast of Nipon.**—From the middle of March to the middle of June sealing vessels may be met with within about 300 miles of the coast, between the parallels of Yedo Gulf and Cape Noyshaf, the herds of seals gradually moving northward towards the Commander Islands, and are found south-eastward of Yezo in May, the vicinity of Cape Yerimo being a favourite resort. Sealers crossing the Pacific Ocean find them as far eastward as long. 180°, in the parallel of Yezo.

Page 848.—*Cape King* is now known as *Kottono hana*. The town of *Kittaasaina* extends about 1 mile northward of it, and the anchorage is off its northern end. At 1 mile farther northward is the mouth of *Sitomura River*, at 7 cables S.E. ¼ S. from which lies *Minne Rock*, of 3 fathoms.

The detached rock, 2¼ miles S.W. of Kitsu Island, has 3 ft. over it at low water springs, with 9 to 15 fathoms close around.

Kitsu ura has regular depths of 10 fathoms and under, but is completely exposed to southerly and easterly winds. The rock 1 mile north-eastward of Kitsu Island is 9 ft. high, and sunken breaking rocks extend about 2 cables N.E. of it.

Uchiura wan is a rocky cove on the western side of *Ko minato Point*, where small craft find shelter off a village.

Pages 848-849.—**KATSU URA** is about 1 mile in extent, but it is encumbered with reefs and foul ground. The anchorage is with the highest part of the reef N.N.W. of Hachiman saki bearing about S.E.

In April, 1905, the steamer *Khalif* was reported to have struck on a rocky patch of about 3 fathoms, at 2½ miles S.W. by S. ½ S. from Hachiman saki. In September, 1905, the steamer *Stanley Dollar* was stated to have struck on a similar patch of about 3½ fathoms, at 2½ miles E.S.E. of Hachiman saki. Both these patches have deep water close around, and passing vessels are advised to give the coast hereabout a berth of at least 3 miles.

Page 849.—*Iwa wada Point* is surrounded by sunken rocks for 1 mile off. At 4 miles northward of it is the town of *Kobama*, connected with the railway system.

INU BO YE SAKI Lighthouse stands 1 mile northward of the South extreme, or in lat. 35° 42′ 13″ N., long. 140° 52′ 22″ E., as determined telegraphically from Tokio observatory. It is proposed to establish a powerful *fog signal* here.

Tone gawa.—On the South side of the entrance is the town of *Hon Choshi machi*, with about 25,000 inhabitants, connected with Tokio by railway. It is high water here, on full and change, at 5h. 6m.; springs rise 4½ ft., neaps 3 feet.

Page 850.—**Reported Rocks.**—On several occasions rocks have been reported to exist far to the north-eastward of Inu bo ye saki, but subsequent search has failed to find them, leading to the belief that the spouting of whales, heavy rips or overfalls in the Kuro Siwo, or drifting wreckage, etc., may have given rise to these reports. In 1888, the steamer *Abyssinia* was reported to have passed about 2½ miles from a dangerous breaking rock or reef in lat. 36° 39′ N., long. 142° 27′ E., or about 108 miles E.N.E. of Inu bo ye saki. It was afterwards searched for in vain by H.M. Ships *Linnet* and *Swift*, the Japanese war-ships *Kaimon* and *Fusan*; and again, in 1900, by the U.S.S. *Albatross*, when a depth of 2,976 fathoms was found 3 miles southward of the above position, and 4,300 fathoms in lat. 36° 20′ N., long. 143° 13′ E.

In 1902, the captain of a Russian schooner reported a rock with only 5 ft. water over it, in about lat. 36° 20′ N., long. 142° 10′ E.

Page 850.—**Naka Minato** or *Machama*, 38 miles northward of the Tone gawa, has anchorage off it with off-shore winds. The river has about 8 ft. over the bar, but is deeper within. Here are the towns of *Minato* and *Iwai*, connected with the railway, which runs along the coast to the northward. Hence to Shioya saki, the coast is fronted by reefs and foul ground, extending 1 mile off in places, and is backed by ranges of mountains.

Onahama wan, 5 miles south-westward of Shioya saki, is a shallow bight, off which there is anchorage in 5 to 10 fathoms, sand, but completely exposed to southerly winds. Onahama is connected with the main line by a branch railway.

SHIOYA SAKI or Toyoma Point, in lat. 37° N., rises to an elevation of 179 ft., and a reef extends 1½ mile S.E. from it.

The Lighthouse, on the South extreme of Shioya saki, is a white brick tower 100 feet high, with a central black band, showing a *flashing bright* light every 20 *seconds*, elevated 260 ft., and visible 23 miles.

Between Shioya saki and Sendai Bay the coast is mostly low and sandy, but hilly inland, and appears to be free from off-lying dangers.

SENDAI BAY, or Ishinomaki wan, is only exposed to southerly winds, and the water shoalens gradually towards its northern low sandy shore. Owing to its favourable position on this exposed coast, and being about midway between the Gulf of Tokio and Tsugar Strait, it has been proposed to construct a large harbour here, for the accommodation of vessels of any size. The positions suggested are Hon ami, Nobiru, or Hanabuchi, the latter being on the western side of the entrance to Matsushima Bay.

Matsushima Bay is fronted by innumerable rocks and wooded islets, forming a beautiful scene, one of the three wonders of Japan, and a great place of pilgrimage. In its western angle is the town of *Shiogama*, connected with the city of *Sendai*, 12 miles inland, by a branch railway, and carries on a large trade in fish and salt. The bay is shallow, the greatest depth being 12 ft., and the Ishihama entrance is encumbered with reefs and rocks, among which there is temporary anchorage for steamers in 5 fathoms.

One, the outer danger off Ishihama, is a detached rocky patch of 4 ft. water, lying 3½ miles S.E. ¼ E. from Hanabuchi saki, the West point of entrance.

Nobiru is situated on the coast, 1 mile northward of Miyako sima; between there is anchorage in 5 to 6 fathoms, but unsafe with S.E. winds. The *Tona Canal*, which connects Kitakami River with the N.E. angle of Matsushima Bay, has a depth of 6 ft., and has an outlet to the sea at Nobiru.

Kitakami River has another entrance in Oppa Bay, to the N.E. *Ishinomaki* has large slate quarries and a salmon fishery.

Orinohama Bay is the N.E. angle of Sendai Bay, and in its southern inlet is the town of *Oginohama*, with anchorage off it in 5 or 6 fathoms. On the North side of the entrance of Oginohama Cove is a white mast, on which a *fixed red light* is shown at an elevation of 129 ft., visible 3 miles.

Tushima Peninsula, southward of Orinohama Bay, mostly consists of rocky bare hills, and its coast is indented by several bays and inlets, with moderate depths.

Page 851.—There is good anchorage in 6 to 9 fathoms in *Kugunari Bay*, next N.W. of Aikawa Bay.

Aji shima, S.W. of the southern extreme of Tushima Peninsula, is about 500 ft. high, and has a rock 2 ft. high 3 cables off its S.E. point. *Miya Kasa ne*, a rocky patch of 3½ fathoms, which breaks occasionally, lies 1½ mile S.W. ½ W. from Aka saki, the western point.

Tashiro shima, N.W. of Aji shima, is also about 500 ft. high, and the intervening channel has an islet and several sunken rocks in it.

KINKUWA SAN or Kingkasan Island rises to an elevation of 1,470 ft., and there are depths of 4 to 4¾ fathoms in the fairway of the channel between it and the coast.

The Lighthouse, on the S.E. point of Kinkuwa san, is a white granite tower. The light now *flashes* every 10 *seconds*, the flashes being alternately *red* and *bright*. The *Siren* now sounds a blast of 4 *seconds*, at intervals of 45 *seconds*.

Yeno shima Islets lie 10 miles northward of Kinkuwa san, the S.E. islet consisting of white rocks. Strangers are advised not to attempt to pass through the channels between them, owing to dangerous rocks.

Onogawa Bay, westward of the Yeno shima, affords anchorage in its S.W. or N.W. angles, the town of *Onogawa* being situated in the latter. In foggy weather, the

approach is dangerous, the tidal streams running strongly among the off-lying islets and rocks. H.M.S. *Audacious* obtained supplies of beef, venison, and vegetables here. *Okashi Bay*, next northward, affords similar anchorage, the town being in its N.W. angle.

Oppa Bay, northward of Okachi Bay, appears to afford safe anchorage only with off-shore winds. The northern branch of *Kitakami River* runs into its head.

Shidzukawa and *Koidzumi Bays* are both exposed to easterly winds. *Kesennuma Bays*, on either side of O shima, afford sheltered anchorage; *Karakuwa saki*, the eastern point, is cliffy.

Hirota Bay, northward of Karakuwa saki, is 5 miles in extent and 2 miles in width, and apparently clear of off-lying dangers. The land around is well cultivated, and poultry and fish may be had. About 10 miles westward of the bay is a conspicuous flat-topped mountain, forming a good landmark from the South or East. Vessels anchor as convenient, off the head of the bay, in depths under 10 fathoms. It is high water, on full and change, at 5h. 5m.; springs rise 4 feet.

Ofunato Harbour, 4 miles N.E. of Hirota Bay, is an inlet surrounded by wooded hills, and has good landlocked anchorage in 7 to 10 fathoms, mud, off the village at its head, but violent squalls sometimes descend from the hills. Fish, potatoes, and vegetables might be obtained here, and extensive harbour works are in contemplation.

Northward of Ofunato Harbour are *Riyouri*, *Otsukirai*, *Yoshihama*, and *Touni Bays*, all open to easterly winds. At 6 miles inland, westward of Touni Bay, the flat-topped mountain named *Goyu san* rises to an elevation of 4,340 feet.

Pages 851-852.—**KAMAISHI HARBOUR** has anchorage in 7 to 8 fathoms, off the town, whence there is a good road to the town of *Morioka*, 70 miles inland. At 12 miles inland are some mines of good iron-ore, which is brought down to the coast by a tramway. *Asa ne* is an isolated rocky patch of 3½ fathoms, 1¼ mile E.N.E. of Mataga saki.

On June 15, 1896, the coast between Kinkuwa san Island and Tsugar Strait was devastated by an earthquake, followed by a great ocean wave from 20 to 50 ft. high, which caused the loss of upwards of 27,000 lives. The chief centre of destruction was around Kamaishi Harbour, and within 5 minutes the town was almost swept away.

Page 852.—*Riyoishi Bay*, northward of Kamaishi, affords shelter to small craft. At 2½ miles northward of Sangan shima is *Ohako saki*, the extremity of a long promontory, with a range of white cliffs on its S.E. side.

ODZUTSU or Odzuchi Bay.—There is anchorage off Odzuchi in 9 fathoms; cattle may be bought here.

Funakoshi Bay, northward of Odzuchi Bay, has sheltered anchorage in 6 fathoms, half a mile off the town in its northern arm. Over the bay rises the conspicuous mountain *Okujira yama*, 1,988 ft. high.

Pages 852-853.—**YAMADA HARBOUR** affords anchorage off the town, in 6 or 7 fathoms, sand. Cattle, venison, fish, and poultry may be obtained here. It is high water, on full and change, at 4h. 30m.; springs rise 4 feet.

One Sho is a dangerous isolated pinnacle rock of 3 fathoms water, with 20 to 60 fathoms close around, and breaks with a southerly swell; it lies off the entrance to Yamada Harbour, at 2 miles S. ¾ E. from Todo saki lighthouse.

Midway between the heads of Yamada Harbour and Miyako Bay the mountain named *Jiu ni jin yama* rises to an elevation of 2,374 feet.

Page 853.—**TODO SAKI Lighthouse** is a white iron tower 101 ft. high, in latitude 39° 32′ 45″ N., long. 142° 5′ E., showing a *flashing bright* light every *half-minute*, elevated 190 ft., and visible 20 miles seaward between N. 7° W. and S. 24° W. In foggy weather, a *Siren* sounds a blast every 45 *seconds*, thus :—low note 4 seconds, high note 4 seconds, silent 37 seconds.

Miyako Bay is only exposed to north-easterly winds, and gales may be expected from that direction near the equinoxes. The anchorage off the town has depths of 8 to 10 fathoms, and there is a good road hence to Morioka, 66 miles inland.

Misaki, in lat. 40° 8½′ N., is a cliffy point, rising to an elevation of 700 ft., and rocks extend nearly 1 mile off it, the outer one being 20 ft. high. *Kuji Bay*, northward of it, is completely exposed to easterly winds, and has some rocks off its northern point. Hence to Same Point the coast is cliffy, with some detached sunken rocks upwards of half a mile off it. About 5 miles inland are two conspicuous mountains, *Taneichi dake*, a peak 2,371 ft. high, and *Hajikami dake* a rounded summit 2,398 ft. high.

Same Point is cliffy, with some off-lying rocks around it, and should be given a berth of at least 1 mile. The bight westward of it affords anchorage, in 4 to 6 fathoms,

sand, but is exposed to north-easterly winds, and is not safe after August. The railway from the South to Aomori here approaches the coast, and a considerable export trade is carried on in fish, oil, &c.

For 30 miles northward of Same Bay the coast is a sandy beach, broken only by the shallow mouths of some large inland lagoons, with many fishing villages along it. In lat. 41° 5½′ N. is *Tomari*, northward of which the coast becomes cliffy for 2½ miles, and the hills again approach the coast. Hence a sandy beach extends in a straight line as far as the cliffs about 3 miles southward of Shiriya saki.

SHIRIYA SAKI has a rocky ridge extending 3 cables N.N.E. from the point, *Todo jima*, a rock 60 ft. high, lying on the extremity. *Shiriya yama* is 1,381 ft. high.

The Lighthouse on Shiriya saki is now considered to be in lat. 41° 25′ 45″ N., long. 141° 27′ 30″ E. The light is now an *electric flashing bright* light every 5 *seconds*, elevated 150 ft., and visible 18 miles. In fogs, the *Siren* now sounds a blast of 4 *seconds* at intervals of 30 *seconds*; if not available, a hand siren will sound a blast every minute for 10 minutes, and then silent for 5 minutes.

Page 854.—*Benten sima*, or *Observatory Islet*, is 2 cables off shore, and 70 ft. high.

Directions.—Beware of reported dangers off Katsu ura (see Addenda for page 848).

Page 854.—**TSUGAR STRAIT** is remarkably free from hidden dangers, and the establishment of powerful lights has rendered its navigation as easy by night as by day. In September, 1907, it was announced that explosive floating mines may still be met with in this region.

In the early part of the year, however, especially in February, March, and April, vessels approaching from the N.E. or eastward must beware of field and pack ice, which may then extend 60 miles or more off the S.E. side of Yezo and the islands north-eastward of it; several vessels have been damaged by ice in this region. In February, 1902, the steamer *Oceana* encountered an immense floe about 200 miles eastward of Tsugar Strait.

The strait is crossed by several *telegraph cables*, as shown on the chart.

Page 855.—**Currents.**—The prevailing easterly current follows the direction of the fairway of the strait, usually running from 2½ to 3½ knots an hour, but increasing to 5 or 6 knots with south-westerly gales. Heavy tide-rips may be met with in the fairway of the narrows of the strait in deep water.

The tidal streams are only felt near the shore, and the flood streams (from East and West) meet off Shiokubi saki. At Tappi saki, on full and change, the eastern stream usually runs from 6h. a.m. to midnight; and at Toma saki, from 8h. a.m. to 2h. a.m.

Page 855.—**Henashi saki**, or *Cape Yokoiso*, is safe of approach; the current usually sets northward off it, 1 to 2 knots an hour, but it may set southward before bad weather. At 19 miles north-eastward of this is the town of *Ajiga sawa*, connected with Aomori by a good road. *Jusan gata*, or *Sasagota Bay*, is visited by junks for timber cargo.

Gongen saki, or *Cape Greig*, is a hilly promontory 788 ft. high. In *Kodomari wan*, the bay eastward of it, there is anchorage in 4 to 6 fathoms; fresh water may be obtained from a cascade.

TAPPI SAKI, or Tatsupi saki, is 381 ft. high, and the rock 1 cable N.E. of it is 117 feet; a rock awash lies 2 cables N. by W. from the cape.

Page 856.—**Sai** is a village 1½ mile north-eastward of *Cape Yakosi*, or *Yagoshi saki*, and has a telegraph office.

OMA or Toriwi saki.—*Omase* or *Singapore Rock*, 9 cables N. by E. ½ E. from Low Islet, has only 6 ft. water over it. A 2½-fathoms rock lies two-thirds of a mile N.W. of Low Islet, and another about half a mile N.E. ½ N. from Low Islet.

Page 856.—**RIKUOKU GULF, or Awomori Bay**, is 5⅔ miles wide at its entrance.

TAIRADATE Light.—On the western side of the entrance of the gulf is the village of Tairadate, nearly 1 mile northward of which stands a white iron tower 61 ft. high showing a *flashing bright* light every 5 *seconds*, elevated 69 ft., and visible 14 miles, between N. ⅔ W. and S. ¼ W. In foggy weather, a *Siren* sounds a blast of 3 *seconds* in every 45 *seconds*.

Page 857.—**AOMORI** is now of considerable importance, being the northern terminus of the eastern and western lines of railway (457 miles from Tokio), and there is daily steamer communication with Hakodate. It was opened to foreign trade in 1906, and sawmills and petroleum stores have been established here. The inhabitants number about 25,000. The chimney of the electric lighting works is conspicuous from sea. Landing is easy at a wooden jetty. Water is obtained from wells, that from the river not being wholesome. The *red light* is no longer exhibited.

Climate.—During a series of 14 years observations, the thermometer varied at Aomori between monthly means of 26° F. in January and 73° in August. The average annual rainfall was 49½ inches, March and April being the driest months, with about 2½ inches in each. From January to March strong N.W. winds prevail, fog being most frequent in May, June, and July.

O or *Natsu sima*, 12 miles N.N.E. of Aomori, is 230 ft. high. In *Kaminato* or *Shiranai Bay*, 6 miles S.E. of it, there is good anchorage in 6 fathoms, mud and sand. The railway passes here.

Nohechi, or *Nofitsi.*—The railway here turns southward inland.

Ominato or *Ando Bay.*—There is a pontoon dock here, 250 ft. long, lifting weights up to 1,600 tons. It is high water here, on full and change, at 4h. 3m.; springs rise 2¾ ft., neaps 1¾ foot. The tidal streams are stated to run nearly 2 knots an hour.

Kaisaki, or *Cape Kusodomari*, rises to an elevation of 373 feet. The smaller *Benten sima*, 2¾ miles S.E. ½ E. from it, is 90 ft. high.

Page 857.— **CAPE YESAN Lighthouse** is a white iron tower 50 ft. high, showing a *flashing bright* light every 15 *seconds*, elevated 144 ft., and visible 17 miles eastward, between N. 14° W. and S. 18° E. Lat. 41° 49′ N., long. 141° 11′ E.

Muino sima, or *Conical Islet*, is 187 ft. high.

SHIOKUBI SAKI, or Cape Blunt, is 3 miles W. ¼ S. from Conical Islet.

The Lighthouse on Shiokubi saki is a white iron tower 23 ft. high, showing a *fixed bright* light, elevated 150 ft., and visible for 17 miles seaward, between S. 76° E. and N. 76° W. In foggy weather, a *Siren* sounds a blast of 6 *seconds* every *minute*.

Page 858.—**Kattoji saki Lighthouse.**—On Kattoji saki, or *Mussel Point*, stands a white tower 27 ft. high, showing an *occulting bright* light, eclipsed for 8 *seconds* in every 20 *seconds*, elevated 137 ft., and visible 17 miles seaward, between N. 47° E. and S. 57° W. Close westward of it is a white tower with a *Bell*, which is sounded 6 times every *minute*, in foggy weather.

Pages 858-859.—**HAKODATE** was a well-built town of nearly 100,000 inhabitants, and has greatly increased in commercial importance, but on August 26, 1907, the greater part of it was reduced to ashes by a disastrous fire. Much of the foreshore has been reclaimed for the construction of quays, and a breakwater built on the N.E. side of the harbour. The latter has also been improved by dredging, there now being a least depth of 5½ fathoms, mud, at the usual anchorage, and there are several mooring buoys at the head of the harbour. Several lines of steamers call here regularly, and there is railway communication with Otaru, Sapporo (the capital), Muroran, and the interior. Several telegraph cables connect it with the main island. Fresh and other supplies are plentiful, and good water is brought in pipes from a distance of 7 miles. The hospitals will admit seamen. Coal and ballast may be had in large quantities, and the aid of steam-tugs if required. There are some cement works on the North side of the harbour.

In 1906, vessels entering from foreign ports numbered 160, with a tonnage of 120,229. The imports, chiefly fish, petroleum, and flour were valued at £167,017; and the exports at £319,895, mostly sulphur, edible seaweed, fish, and salt.

A dry dock has been constructed here; it is 531 ft. long, with an entrance 82 ft. wide, having 28½ ft. over the sill at high water springs. A patent slip can raise vessels weighing up to 1,800 tons. Repairs of all kinds can be executed for vessels and their machinery.

Time Signal.—At the Meteorological Office flagstaff, on the East side of the harbour, a red and white striped flag is hoisted half-mast at 11h. 55m., close up at 11h. 58m., and dropped (by electric current from Tokyo Observatory) at noon, mean time of long. 135° E., equivalent to 3h. a.m., G.M.T. Lat. 41° 46′ 35″ N., long. 140° 43′ 45″ E.

Climate.—Hakodate is healthy, but fogs prevail from May to October, and thick weather in January and February. Snow falls heavily in winter, and is experienced from the end of October to the beginning of May. From observations extending over 10 years, the temperature varied from a maximum of 88° F. in August and September to a minimum of -7° in January. The average annual rainfall is 47 inches, September being the wettest month (7½ inches). Westerly and north-westerly winds are most prevalent, and north-easterly winds least so.

Benten or *Anama Point.*—Land has been reclaimed here, northward of the fort, and a harbour constructed for small vessels. The extremity of the spit is marked by a *conical red buoy*, bearing a *triangle*, in 5 fathoms.

The beacons for marking the edge of the bank on the West side of the anchorage no longer exist.

Pilotage is not compulsory: if a pilot be employed, the charge is 5 yen.

Page 860.—*Tides.*—It is high water, on full and change, at 4h. 10m.; springs rise $3\frac{3}{4}$ feet, neaps $2\frac{1}{4}$ feet.

Directions.—*Komagadaki* is a volcanic mountain 3,779 ft. high, about 19 miles northward of Hakodate, with a sharp peak on its S.W. side.

Page 860.—**Cape Tsiuka** is now known as *Yagoshi saki.*

Page 861.—**CAPE SIRAKAMI Lighthouse** is an iron tower 50 ft. high, painted in black and white bands, showing a *flashing* light every 40 *seconds*, alternately *red* and *bright*, elevated 120 ft., and visible for 17 miles seaward, between N. 80° E. and N. 73° W. In foggy weather, a *Siren* sounds a blast of 4 *seconds* every *minute*; if not available, a *hand-siren* sounds a blast every minute for 10 minutes, and is then silent for 5 minutes. Lat. 41° 24′ N., long. 140° 12′ E.

Fukuyama has about 5,000 inhabitants; some fresh provisions and good water can be obtained here, and there is frequent communication with Hakodate by steamer.

Benten jima Light.—Near the temple on the islet off Cape Tadeisi stands a white wooden turret showing a *fixed bright* light, elevated 80 ft., and visible 9 miles. In foggy weather, an *explosive report* is made every 15 *minutes*. Foul ground extends about 3 cables southward of the islet.

KO SIMA, $17\frac{1}{2}$ miles W. $\frac{1}{2}$ S. from Cape Sirakami, is about three-quarters of a mile in diameter, and *O sima* lies 21 miles to N.W. by W. $\frac{1}{4}$ W.

Pages 862-863.—**YEZO, or Hokushu**, is the chief member of the *Hokkaido* (meaning "northern sea circuit"), which includes the Kurile and adjacent islands. The word Yezo means "abounding in game," which includes deer, bears, foxes, and other furry animals, but the valuable fisheries are the chief support of the people, large quantities of dried herrings, salmon, &c., oil, and fish manure being exported. The Japanese are establishing agricultural colonies in the southern parts of the island, for the production of peas, beans, potatos, grain, fruit, and vegetables.

Yezo has an area of about 30,000 square miles, nearly that of Ireland, but the larger part is covered by trackless forests of valuable timber, such as oak, elm, walnut, birch, and maple, and it is hilly and mountainous, the highest peak being *Shirebetsu san*, 6,263 feet, in its western part. There are many extinct volcanos, and several showing signs of activity, and yielding considerable quantities of sulphur. Earthquakes are also occasionally experienced.

Deposits of gold, copper, lead, silver, manganese, petroleum, and other minerals exist in various parts of Yezo, but have hitherto not proved profitable to work on a large scale. The chief mineral wealth consists in valuable seams of excellent coal, which is shipped in large quantities at Mororan.

In 1905, the population of Yezo numbered 810,446, including about 17,000 (Mr. S. Landor* says 8,000) of the ancient Ainu inhabitants, who are said to be decreasing in numbers; in summer, the population is largely increased by fishermen coming from the main island of Japan. The chief towns are Sapporo (the capital), Hakodate, and Fukuyama, and the two former are now connected by railway, which is being extended in various directions, there being about 600 miles in operation in 1906.

The climate of Yezo is healthy and bracing, but very cold in winter; the mountain tops are covered with snow in September, and in the lowlands it lasts from October until May or June. In summer, mosquitos and other insects are very troublesome.

Page 863.—**IBURI or VOLCANO BAY** is about 29 miles in diameter, and appears to be remarkably free from off-lying dangers. Its waters abound with fish, such as mackarel, sprats, halibut, and herrings, while the surrounding country is rich in minerals. The railway from Hakodate to Otaru and Sapporo runs close along its western shore, and several telegraph cables run across the entrance of the bay to Mororan. Over the S.W. point of the entrance rises *Sawara dake*, or *Komaga take*, an isolated magnificent volcanic peak 3,744 ft. high, emitting dense clouds of vapour.

Page 864.—**MORORAN, Muroran,** or *Endermo Harbour*, is fast rising into importance as a coaling port, excellent coal being brought down by railway from the mines in the interior. In 1906, the vessels entering numbered 114, with a tonnage of

* A most interesting account of Yezo and its people is given by Mr. A. H. Savage Landor in his book, "Alone with the Hairy Ainu," and in a Paper appearing in Vol. iii. of Supplementary Papers of the Royal Geographical Society. In the same volume are some "Notes on a Journey in Yezo" by Prof. John Milne, F.R.S. Another interesting book is "Sea-girt Yezo," by the Rev. J. Batchelor, C.M.S., 1902.

271,028; in 1905, 122,795 tons of coal were shipped, besides large quantities of timber and railway sleepers, with grain, sulphur, cement, manganese, &c. The harbour affords spacious anchorage for the largest vessels, quite safe during the prevailing southerly winds of summer, but unsafe during the strong N.W. winds of winter.

The town, at the head of the harbour, contained 7,897 inhabitants in 1905, and is connected with the telegraph system. There is a daily service of steamers to and from Hakodate, and also railway connection by way of Sapporo and Otaru. Land has been reclaimed, and vessels can load the coal from a pier or by means of lighters. Fresh provisions, beef, and water can be obtained.

Light.—On *Daikoku sima* stands a wooden turret painted white with a central black band, showing a *fixed* light, *bright* from S. ½ E. to S.W., *red* over One from S.W. to N. 30° W., and *bright* thence to S. 60° E., elevated 134 ft., and visible 9 miles. In foggy weather an *explosive* signal is fired every 20 *minutes*.

The light previously shown on the western shore is discontinued.

One is a rocky shoal of 3½ fathoms, 7 cables N.W. ¾ N. from Daikoku sima, easily avoided by keeping within 2 to 4 cables of the island.

It is high water, on full and change, at 4h. 3m.; springs rise 6 ft., neaps 3½ feet.

The railway skirts the coast eastward of Mororan, and at 12 miles distant is the stream named *Nobori*, and about 2½ miles inland are some hot springs. At *Tomakomai*, 22 miles farther on, the railway turns inland, and here is the largest village between Mororan and Cape Yerimo, with a sardine fishery. The country hereabout is flat and marshy.

Urakawa, 25 miles north-westward of Cape Yerimo, is a fishing village and edible seaweed gathering place. A *fixed bright light*, elevated 128 ft., and visible 6 miles, is shown from a turret painted white with a central black band.

Horo izumi, 7 miles N.N.W. of Cape Yerimo, is picturesquely built on the cliffs. There is a large salmon and sea fishery here, and seaweed is also gathered for export. A *fixed red light*, elevated 72 ft., and visible 6 miles, is shown from a white turret; bearing N.E. by E. it will lead clear of the reefs to the anchorage, in 7 fathoms, sand.

Page 865.—**YERIMO SAKI Lighthouse** is a white iron tower 27 ft. high, showing a *revolving bright* light every *half-minute*, elevated 233 ft., and visible 21 miles. In foggy weather, a steam *Siren* sounds a blast of 7 *seconds* with silent intervals of 1 *minute*; if not available, an air siren sounds a blast of 6 seconds with intervals of 20 seconds. Lat. 41° 56′ N., long. 143° 14′ 30″ E.

In 1895, a 5-fathoms shoal was reported to lie about 18 miles W. by S. from Yerimo saki, but a careful search by Japanese officers in 1906 failed to find any trace of it.

The S.E. Coast of Yezo, north-eastward of Cape Yerimo, has wide plains suitable for agriculture at the foot of the hills, but this coast is deserted and desolate, being subject to thick fogs, and there are no harbours or sheltered anchorages along it.

Tokachi River enters the sea by a delta about 50 miles north-eastward of Cape Yerimo; it is one of the largest rivers in Yezo, and abounds with salmon. Driftwood is plentiful on the coast south-westward of it. Mr. Savage Landor explored this river and its tributaries.

About 30 miles north-eastward from the Otsu or western mouth of the Tokachi, is *Shiranuka*, near which are some deposits of inferior coal. The railway from Kushiro runs along this coast.

KUSHIRO, or Kusuri, promises to become of considerable commercial importance, having already a considerable trade in the export of coal, sulphur, timber, salmon, herrings, fish manure, and edible seaweed. A railway is being constructed westward into the interior, and a tramway brings the Harutori coal, which burns with much ash, to the coast for shipment. The *Kutcharo River* is navigable by small boats for nearly 20 miles; they bring down the Yuzan sulphur. Fresh provisions may be had here, and there is regular communication with Hakodate by steamer.

Light.—On Kushiro saki stands a wooden tower 25 ft. high, painted in black and white bands, showing a *flashing bright* light every 15 *seconds*, elevated 145 ft., and visible 14 miles.

A broad reef, partly uncovered at low water, reaches nearly 6 cables off the South point of the roadstead. The anchorage has depths under 10 fathoms, but is only safe with off-shore winds, and vessels have been lost here owing to icebergs being driven in by southerly winds.

AKKESHI or Akishi Bay seems destined to become one of the principal trading centres of Yezo, and already carries on a considerable trade in fish, seaweed, timber, and tinned oysters from the lagoon. The town, on the N.E. side of the bay, contains

about 5,000 inhabitants; it is connected with the telegraph system, and is visited regularly by the coasting steamers. Thick fogs are very prevalent in this region.

Light.—Daikoku sima is conspicuous, being bold and rocky, 370 ft. high, and on its South end stands a white wooden tower 18 ft. high, showing a *fixed bright* light, elevated 364 ft., and visible 10 miles.

Akkeshi Bay affords excellent shelter, except during strong southerly winds, which send in a considerable sea. It is high water, on full and change, at 4h. 5m.; springs rise 5½ feet.

Kambokijima, 1 mile south-westward of Kiritappu sima, is 196 ft. high, with a shallow channel between it and the shore; about a mile southward of the islet are some rocks with 9 ft. water over them.

Kiritappu sima is 162 ft. high, and connected with the coast by a bridge. On it is the principal settlement of Hamanaka Bay, there being a considerable fishery here, and edible seaweed is exported in large quantities. Herrings, salmon, oysters, and water may be obtained here.

Hamanaka Bay has regular depths of 8 fathoms and under, and is only open to the East, from which direction the off-lying reefs afford shelter. Fog is very prevalent here, and ice is sometimes drifted in by easterly winds. South-west winds prevail in summer, and N.W. winds in winter. *Shiro* and *Kuro iwa* are about 46 ft. and 22 ft. high respectively.

Page 866.—**Otchishi saki**, or *Cape Usu*, is a flat wooded peninsula, fronted by rocks; with off-shore winds there is anchorage off the sandy beach on its western side.

The Lighthouse on Cape Usu is an iron tower 50 ft. high, painted in black and white bands, showing a *flashing* light every *half-minute*, elevated 168 ft., and visible 18 miles. It is *bright* from N. 32° E. to N.59° E.; *red* thence, over Tatsumino Rock, to N. 65° E.; *bright* thence southward to S. 53° W.; and *red* thence, over Konbu se, to S. 75° W.

Konbu se are some dangerous sunken rocks lying between 2½ and 6 miles S.W. by W. and W. by S. ½ S. from Cape Usu lighthouse. Several vessels have been drifted and wrecked on them, owing to the prevailing westerly set along the S.E. coast of Yezo, between Cape Noyshaf and Kushiro.

Bokkiroso Bay, a most picturesque spot on the East side of Cape Usu, affords good anchorage for small craft, in 4 to 6 fathoms, sand and mud, but the entrance is only 1⅓ cable wide between rocky spits on either side. Good fresh water, vegetables, and firewood may be had here, and there is a good road hence to Nemoro.

The coast hence to Cape Noyshaf is flat and monotonous, with patches of stunted wood and open ground. It is mostly fronted by rocky reefs; at 5 miles north-eastward of Cape Usu is a group of islets and rocks, of which *Yururi sima*, 187 ft. high, is the largest. *Tatsumino se* is a dangerous sunken reef 9½ miles N. 63° E. from Cape Usu lighthouse, and a breaking rock lies about 1 mile farther to N.E. by E.

Hanasaki is a military settlement 7 miles N.E. of Cape Usu; there is a landing pier here, and fresh water may be obtained.

Light.—At Hanasaki is a square white beacon 12 ft. high, on which is shown, from December 1 to April 30, a *fixed bright* light, elevated 87 ft. and visible 6 miles seaward between N. 83° E. and N. 48° W.

Tomoshiri Bay, next N.E. of Hanasaki, has a sandy beach at its head; two islets lie on the reef extending off its eastern point, and there is anchorage in 6 to 7 fathoms, sand, 3 cables N.W. of them. Hence to Cape Noyshaf the coast is fronted by reefs and islets, and should have a wide berth.

CAPE NOYSHAF Lighthouse is in lat. 43° 23′ N., long. 145° 49′ E. The light now shows *bright* between N. 70° W. and S. 16° E.; and *red* over dangers between S. 16° E. and S. 20° W. The light and fog signal are in operation all the year round.

Goyomai Strait has a safe channel about half a mile wide between Cape Noyshaf and *Sora kara Rocks* and reefs. The lighthouse bearing N.W. will lead safely towards it; pass half a mile eastward of the lighthouse, and if bound to Nemoro do not alter course to the westward till at least one mile northward of it. The flood stream runs S.E. through the strait, from 1½ to 2½ knots, and the ebb the reverse.

SUISHO ISLANDS are the chain of islands between Cape Noyshaf and Shikotan *(see the Addenda for page* 741*)*; they are all low and of irregular outline, surrounded by rocks and reefs, and anchorage may be found among them.

Suisho sima, 4½ miles north-eastward of Cape Noyshaf, is from 30 to 50 ft. high. Good water may be obtained from a well at the head of the bay at its S.W. extreme. *Akiyuri sima*, 3½ miles to S.E., is 138 ft. high, and has a stream of good water on its North side. *Yuru sima*, to the N.E., is 154 ft. high, with a clear channel between.

Suisho Channel, between these latter islands and Suisho, is 3 miles wide, but there are several sunken dangers in the approaches, as shown on the chart.

Shibotsu sima is about 5 miles in extent, but less than 100 ft. high. *Taraku sima*, to the N.E., is less than 60 ft. high, and several isolated rocks lie 2 to 4 miles south-eastward of it, under 150 ft. in height.

Shikotan Channel is 12 miles wide, between Taraku and Shikotan, with depths under 20 fathoms, but a dangerous detached patch of 1¼ fathom, named *Amagi Reef*, lies 5½ miles N.E. of Taraku sima.

Walvis Bay has depths of 6 to 10 fathoms over it, affording anchorage with bottom of fine sand, mud, or lava. The coast is wooded, but low and marshy on the South and West sides of the bay, with large lagoons bounded by pebble beaches.

Page 867.—**NEMORO** is now of considerable commercial importance, having about 18,000 inhabitants, chiefly engaged in the fisheries, and carrying on what trade there is with the Kurile Islands. There is an agricultural settlement here, the soil being fertile, and yielding fair crops of potatos, vegetables, grain, etc., notwithstanding the inclement climate. The harbour is frozen over from January to March, the ice then extending seaward for miles, and in summer thick fogs are prevalent. The Japanese government has a coal depôt here, and there is regular communication with Hakodate by steamer, when navigation is open. It will shortly be connected with the railway system of Yezo. There is a telegraph cable to Keramoi saki, Kunashiri Island (*see Addenda for page* 741). It is high water, on full and change, at 4h. 9m.; springs rise 5½ feet.

Notske Spit is fronted by *Suijin Bank*, with 4 ft. least water, and other shoals extend 5 or 6 miles eastward of it, on the southern side of the fairway of Yezo Strait.

Cape Sirotoko is in about lat. 44° 21′ 30″ N., long. 145° 21′ E., and is the termination of a mountainous volcanic promontory, with peaks up to 5,500 ft. high.

Page 868.—**Abashiri** is at present the only place of any importance on the North coast of Yezo, and affords fairly good anchorage for small craft. The cliffs here are very rugged, and of various colours; the surrounding country is well wooded, and there is a poplar match-wood factory. It has been proposed to construct a harbour here, or at *Saruma Lagoon* farther westward.

Cape Notoro is reported to have some breaking rocks off it. There are also some sunken rocks 2 to 4 cables off *Monbetsu saki*.

In September, 1907, a sounding of 6¾ fathoms was obtained from the steamer *Suminoye maru*, about 2½ miles off shore abreast *Omu* and north-westward of *Sawaki*, in about lat. 44° 36′ N., long. 143° 0′ 45″ E.

Yesashi, about 17 miles north-westward of Horonai or Poronai, is a fishing and gold-mining settlement, fronted by ledges and shoals. A *red light* is sometimes shown, and at 6 cables S. 58° E. from it is a *red* cask *buoy*, at the S.E. end of the shoal in the anchorage. A rocky patch of 2¼ fathoms lies about 3 miles off a projecting point 3 miles to S.S.E. Hereabout the coast becomes hilly, and so continues to the N.W.

In 1902, the captain of the steamer *Hidaka maru* reported that his vessel struck on a rock about 9 miles off shore, in lat. 45° 20¾′ N., long. 142° 22′ E.

CAPE SOYA, &c.—See the Addenda for page 756.

Page 868.—**The West Coast** of Yezo has been surveyed by the Japanese, and there are several settlements along it, but few good anchorages.

Yesasshi, or *Esashi*, has salmon and herring fisheries, and now contains about 15,000 inhabitants; it has regular steamer communication with Hakodate. There is a hospital here, and fresh provisions and water can be supplied. It is surrounded by thick forests, and at 4 or 5 miles inland is the double peak *Sasa yama*, 2,017 ft. high, a good mark. In summer the prevailing winds here are off-shore; in winter, West and northerly winds prevail, causing heavy seas.

Light.—On *Kamome sima* is a white wooden turret, showing a *fixed bright* light, elevated 104 ft., and visible 9 miles.

Odobe is 6 miles northward of Yesasshi, and the white cliff is 329 ft. high.

Page 869.—*Ponmoshiri saki*, in lat. 42° 8′ N., is low and rocky, and here is the village of *Kumaishi*, with a good herring fishery. At 5 miles N.E. of it *Shiramizu dake* rises to 3,752 feet. In *Kudo Bay* a telegraph cable is landed from Okusiri Island.

OKUSIRI ISLAND rises to an elevation of 1,914 ft., and between the summit and the North point are three peaks about 1,300 ft., high, conspicuous from the N.W. or S.E. The population numbers about 1,300.

The Lighthouse on *Inaho saki*, the North extreme of Okusiri, is an iron framework tower 60 ft. high, painted in black and white bands, showing a *flashing bright* light

every 15 *seconds*, elevated 150 ft., and visible 18 miles between S. 89° W. and S. 5° E. In foggy weather, an *explosive* signal is fired every 20 *minutes*.

Motsuta or *Sutsuki saki* is cliffy and steep-to, and at 4 miles north-eastward of it is a conspicuous waterfall near some black wooded cliffs.

Suttsu or Ushoro Bay has several fishing villages around it, and fishing nets sometimes extend 1½ mile off. The town, on the western side, now has about 5,000 inhabitants, and is in communication with Hakodate by steamer and telegraph; it is only 7 miles from the railway. Fog prevails in June and July.

Light.—On *Benkei misaki* stands a white wooden turret, showing a *fixed bright* light, elevated 81 ft., and visible 9 miles.

Page 870.—**Iwanai,** at the head of Siru-unku Bay, now contains about 13,000 inhabitants, and is about 8 miles from the railway. Beef, fowls, vegetables, etc., can be had here. There is anchorage in 7 fathoms, sand, about 4 cables northward of the town, or nearer in 3 to 4 fathoms. Coasting steamers call here regularly. *Shiribetsu san*, 6,263 ft. high, lies about 15 miles to the S.E., forming a conspicuous mark.

The coal is shipped at *Kayanuma*, 3 miles N.N.E. of Iwanai, by vessels lying at anchor.

KAMOI SAKI, or Cape Novosilzov, is a sharp rocky projection 270 ft. high, with rocks extending one-third of a mile off.

The Lighthouse on the N.W. extreme of Kamoi saki is a red iron tower 19 ft. high, showing a *revolving bright* light every 40 *seconds*, elevated 248 ft., and visible 18 miles. Lat. 43° 20′ N., long. 140° 21′ 30″ E.

Furubira or *Maloyama Bay* is sheltered from the N.W. by *Maruyama saki*, 640 ft. high; the town now has about 4,000 inhabitants, and westward of it is a peak 1,393 feet high, crowned with trees.

Yoichi Bay lies eastward of a cliffy point 975 ft. high, 7 miles E.S.E. of Furubira, and affords anchorage in 7 to 8 fathoms, sand, half a mile off the town in its western angle. The town has about 4,500 inhabitants, and fresh provisions and water may be had here. The railway from Hakodate runs past the head of the bay.

Shioya Bay, eastward of Yoichi, has anchorage in 4 to 9 fathoms, with off-shore winds.

OTARU, or Oterranai, in the western angle of Ishikari Bay, now has about 75,000 inhabitants, and is of considerable commercial importance, being the only safe port on the western coast of Yezo; it exported timber, railway sleepers, salt, etc., to the value of £389,205 in 1906, when 146 vessels entered the port, with a tonnage of 144,187. It is 159 miles distant by railway from Hakodate, and the line is continued to *Sapporo*, 19 miles farther on, whence it is prolonged into the interior of the island. The coal formerly shipped at Otaru is now sent down by railway from the mines to Mororan but vessels requiring coal can obtain it here. There is regular communication by steamer with Hakodate.

A breakwater is being constructed in a S.S.E. direction from the point northward of the town, to shelter about 900 acres of the anchorage, and will be about 1,400 yards in length when completed; a *buoy*, bearing two *red* lights, was placed off the works.

Vessels anchor off Otaru as convenient, and there are mooring buoys southward of the railway pier, but vessels approaching must beware of fishing nets reaching 3 or 4 cables off shore at times. It is high water, on full and change, at 4h. 12m.; springs rise 1¼ foot.

From April to October the sea is usually smooth off Otaru, but during the remainder of the year it is rough, and heavy westerly and northerly gales are experienced. The sea does not freeze here in winter.

Ishikari River takes its rise near the centre of Yezo, and has a course of upwards of 100 miles; it is navigable by small steamers as far as *Kabato*, 45 miles from its mouth. The bar silts up in the winter, but the spring floods deepen it to from 6 to 10 feet, and there are depths from 3 to 5 fathoms for several miles within the entrance, which is 2 cables wide. Enormous numbers of salmon ascend the river in September, but the quality is not equal to European or Canadian fish. Petroleum exists in this region.

Light.—On the S.W. side of the river entrance stands a wooden tower 40 ft. high, painted in black and white bands, showing a *fixed bright* light, elevated 48 ft., and visible 6 miles.

For 11 miles south-westward of the river entrance the coast is a low cultivated plain, on which at about 8 miles inland is the town of *Sapporo*, the capital of Yezo, with about 52,000 inhabitants.

Page 871.—About 10 miles northward of Ishikari is the village of *Atsuta*, and some sunken rocks lie off the intervening coast; northward of this the coast becomes

mountainous. *Aikappu misaki*, or *Cape Buyimawas*, is precipitous, and about 5 miles northward of it is the village of *Moye*. *Ofuwi misaki*, 8 miles farther on, is 300 feet high, and there is a large fishing village here, with a conspicuous waterfall southward of it; hereabout rocks are said to extend 1½ mile off.

Mashike, or *Maski*, contains about 5,000 inhabitants, and is in regular communication with Hakodate by steamer. Beef, fowls, salmon, vegetables, and water may be obtained here. Vessels anchor off it in 4 to 6 fathoms, sand, and the anchorage is safe from March to September.

Light.—A *fixed bright* light, elevated 134 ft., and visible 6 miles, is shown from a white turret in the town.

Rumoi, 7 miles north-eastward of Mashike, has about 3,000 inhabitants, with open anchorage off it in 3 to 5 fathoms, sand. The river has depths of 6 to 10 feet over its bar, and small boats can ascend it for upwards of 20 miles. Good coal has been found some miles up it. A few provisions, with fish, firewood, and vegetables, may be had.

Onika is another large fishing village, 12 miles northward of Rumoi, and between this and Tomomai the coast is fronted by reefs extending 3 to 6 cables off.

Tomomai saki, or *Shishkoff Point*, is a bare bluff about 200 ft. high, with foul ground extending about a mile off it. The town has over 6,000 inhabitants, and small craft anchor off it in 2 to 3 fathoms. Provisions, water, fish, firewood, and vegetables may be had here.

At 4 miles N.N.W. of Tomomai is the entrance of *Haboro River*, abreast of which is *Haboro sho*, an isolated rock of 3 fathoms, lying 3½ miles N. ½ W. from Tomomai.

Yagishira sima, 12 miles N.W. of Tomomai, is 303 ft. high, and has a fishing village on its eastern side, off which there is anchorage, and a telegraph cable connects it with Tomomai. A rocky reef extends over half a mile eastward of the S.E. point.

Teuri sima is 618 ft. high, and has a fishing village on it; there is anchorage in 14 fathoms, sand, about half a mile off its S.E. side. *Nakano se* is a sunken reef lying off its eastern point, and there is a depth of 8 fathoms in the fairway between this and Yagishira.

Northward of Furibets to Cape Nossyab the coast is mostly a low sandy beach, backed by marshes, but near *Wimbets* or *Onbetsu River* are some cliffs appearing like cones arranged along the beach. *Teshio River* entrance is liable to be blocked by a sandy bar; salmon and sea-trout are caught in it. Northward of this much wreckage is found on the coast.

Bakai misaki, or *Cape Isya*, is low and sandy, and the coast southward of it is fronted by a shallow bank; tide-rips are often met with hereabout, extending 2 miles off shore. With off-shore winds, there is anchorage in 12 fathoms, 3 miles northward of the cape.

CAPE NOSSYAB, CAPE SOYA, &c.—See Addenda for pages 755-756. The rock on which the *Teshio maru* struck has been found to lie 4¼ miles S. 73° E. from the Wakkanai lighthouse.

Page 871.—**The WEST COAST of NIPON, or Honshu**, is about 900 miles in extent between Tsugar and Simonoseki Straits, and has been surveyed by Japanese officers. There are numerous villages along it, but few towns of any note. In winter, or for nearly 6 months of the year, navigation is dangerous owing to the prevailing N.W. gales; its northern part is then very cold, the canals and rivers being frozen up at Niegata. In January and February the country is covered by 3 or 4 feet of snow.

Current.—The northern branch of the Kuro Siwo sets along the western coasts of Kiusiu, Nipon, and Yezo, throughout the year, running strongest in summer, the average velocity being about one knot an hour. Off Tsuno sima (long. 130° 50′ E.) it forms heavy rips, and then sets north-eastward towards Koyama misaki, causing rips where it meets the tidal streams within 2 miles or more of the shore, and so continues towards Hino misaki, whence it sets eastward past Oki Islands. Off the North end of Noto Peninsula it sets strongly inside the off-lying reefs, but there is a counter-current close to the land. In Toyama Bay, the tidal streams are felt, but only changing every 12 hours.

Between Sado Island and the shore the current mostly sets northward, unless strong N.E. winds prevail. Inshore of a line joining Awa sima and Tabu sima, the current is not felt, but outside it sets N.N.E., increasing in strength as Bittern Rocks are approached, whence it turns to the N.E., into Tsugar Strait. A branch of it also continues northward along the western coast of Yezo, running about half a knot an hour.

Page 872.—**Henashi saki.**—See Addenda for page 855.

Kiuroku jima, or *Bittern Rocks*, in lat. 40° 32′ N., long. 139° 29′ 30″ E., lie 16½ miles W. ¾ S. from Henashi saki, and are from 6 to 18 ft. high. A rock awash lies 2 cables S.E. of the largest rock, and one with 6 ft. over it 2½ cables to N.E. by N. A 3-fathoms rock lies 11 cables to W. ½ N., and one of 2¼ fathoms 7 cables to W. by N. ⅓ N.

Sugo saki, 10 miles S. by E. ¼ E. from Henashi saki, rises to a wooded hill 2,092 ft. high, and at 13 miles farther on is *Yoneshiro gawa*, with a depth varying from 5 to 10 ft. over the shifting bar. On the South side of the entrance is the town of *Noshiro*, with about 13,000 inhabitants, exporting grain, beans, and timber. It is about 3 miles from the railway. Some beef, poultry, fish, vegetables and water can be obtained here. Temporary anchorage can be found southward of the entrance, about 1 mile off shore, in 6 to 8 fathoms, sand.

For 11 miles southward of Noshiro the coast is sandy, with low flat hills, and thence for 8 miles to *Hatto saki* consists of dark broken cliffs.

Niudo saki, about 4 miles north-westward of Hatto saki, is a low grassy projection, the N.W. extreme of *Oga Peninsula*, which rises in wooded hills to an elevation of 2,342 feet. A rocky reef extends about two-thirds of a mile N. by W. from the point.

The Lighthouse on Niudo saki is a white iron tower 81 ft. high, showing a *flashing bright* light every 10 *seconds*, elevated 183 ft., and visible 20 miles, but obscured by the land when bearing northward of N. 15° E. It is in lat. 40° 0′ 30″ N., long. 139° 41′ 30″ E.

There is anchorage in 6 to 12 fathoms, sand and mud, about 7 cables S.E. by E. from the lighthouse, off the village of Hatakemura.

Shiose saki, 9½ miles S. by E. from Niudo saki, is low and grassy, and the intervening coast is fronted by rocks.

Funakawa Bay, on the S.E. side of Oga Peninsula, is sheltered from northerly and easterly winds, but is open to the prevailing southerly winds of summer, when it is unsafe; it is much used in winter. The depths are irregular, the bottom consisting mostly of soft rock. The town of *Funakawa*, with about 4,000 inhabitants, stands on the western side of the bay, and is fronted by sunken reefs extending upwards of 1 mile off, with a *conical black* beacon *buoy* in 4 fathoms on their outer part.

Light.—Neno saki, at the South end of the town, is a whitish cliff, on which stands a white turret, showing a *fixed* light, elevated 141 ft., and visible 9 miles; *bright* from N. 22° E. to S. 77° E.; *green* thence to S. 66° E., over shoals 8 to 9 cables distant; *bright* thence to S. 5° E.; *red* thence over Akane Reef to S. 10° W.; and *bright* thence to S. 36° W.

Hachiro gata is an extensive lake eastward of the Oga Peninsula, with depths up to 2½ fathoms; the entrance, 6 miles eastward of Funakawa, only has about 1 foot water in it. The coast between Funakawa and Omono gawa is sandy, but 11 miles inland from the latter *Tahei san* rises to an elevation of 3,858 feet.

Omono gawa, 11½ miles S.E. of Funakawa, has 6 to 10 ft. water over its bar, off which there is temporary anchorage in 5 to 10 fathoms, sand. At 1 mile up the river is the town of *Tsuchizaki*, with about 12,000 inhabitants, and situated on the railway.

For 5 miles southward of Omono gawa the coast continues low and sandy, and then becomes hilly as far as the shallow *Fuki ura gawa*, in lat. 39° 4½′ N. At 8 miles eastward of the latter *Chokai san* rises precipitously to an elevation of 7,350 ft., its summit usually clouded over. From Fuki ura a low sandy shore trends 19 miles S.S.W. to *Kamo*, a town of about 5,000 inhabitants.

Sakata Harbour, 9 miles S.S.W. from Fuki ura, is the estuary of the *Mogami gawa*, but the shifting entrance is narrowed to about 100 yards by shoals on either side, and has an average depth of 7 ft. over its bar. It is only used by junks and other small vessels. The town has about 22,000 inhabitants, and supplies may be obtained here.

Light.—On the south side of the entrance stands a white wooden tower 30 ft. high showing a *fixed bright* light, elevated 54 ft., and visible 6 miles. Southward of the lighthouse is a mast, on which signals as to depth, etc., are made by means of flags.

With off-shore winds, there is anchorage in 7 fathoms, mud and sand, about 8 cables W. by N. from the lighthouse.

Tobi or *Tabu sima* lies 15 miles off shore, and is 227 feet high. *Observatory Rock* is in long. 139° 33′ 30″ E.

Between Kamo and *Senami hakuchi*, a town 33 miles to S.W. by S. ½ S., the coast is hilly. It then becomes low and sandy, and so continues for 40 miles to Kakuta saki, to S.W. ¾ W.

Awo sima is 3¾ miles in extent, and 870 ft. high, its N.E. extreme being in long. 139° 15′ 10″ E. Reefs extend about half a mile off its North and South extremes. Coasting steamers and other vessels find anchorage in about 10 fathoms, at 4 cables N.E. of the village of *Machama*, on its eastern side, sheltered from westerly winds.

Pages 872-873.—**SADO ISLAND** contains about 120,000 inhabitants, and is connected with the mainland by a telegraph cable. *Kinpoku san* rises about the centre of its N.W. part to an elevation of 3,895 ft., the summit of the island. The remarkable isolated conical hill on its North extreme is 572 ft. high. Rocks extend about 1 mile off the North end of Sado.

Yebisu or *Ebisu ko*, or *Minato-mats*, affords anchorage as convenient off the village at its head, in 16 fathoms and under, sand and mud. There is regular communication by steamer with Niegata. It is high water, on full and change, at 2h. 57m.; springs rise 1¼ foot.

Light.—On *Hime saki*, or *Okawa Point*, stands a white iron tower 40 ft. high, showing a *fixed bright* light, elevated 136 ft., and visible 10 miles seaward between W. ½ S. and S.E.; when within 1½ mile it is obscured by the land between S.E. ⅔ E. and S.E.

Futami Bay, on the S.W. side of Sado, does not afford safe anchorage with strong southerly or westerly winds. Vessels anchor in 5 or 6 fathoms, sand, off the village on its western shore, the dangers off which are marked by three *buoys*.

Aikawa Bay is a dangerous rocky bight, 5 miles northward of Futami Bay, and only affords shelter to small craft during easterly winds. The town has about 15,000 inhabitants.

Page 873.—**Shinano gawa** is one of the largest rivers of Japan, having a course of about 200 miles. Its entrance is unfortunately blocked by a shifting sandy bar, rendering it inaccessible to vessels drawing over 8 feet, though it deepens to 4 fathoms within. Small steamers ascend it to *Nagaoka*, about 40 miles above Niegata, and in its vicinity are some productive petroleum wells.

Two breakwaters are under construction at the entrance of the river, to confine and deepen the channel, but the works have suffered greatly from storms.

NIEGATA contains about 60,000 inhabitants, but has little or no direct foreign trade. It is connected with the railway and telegraph systems, and coasting steamers keep it in communication with Hakodate, Simonoseki, etc. A small supply of coal might be had here, and petroleum is shipped to Japanese ports in large quantities.

Climate.—During a series of 10 years observations, the temperature at Niegata varied between extremes of 15° F. in January and 96° in August, with an average annual rainfall of 71 inches. Fog occurs but seldom. From November to March snowstorms and heavy gales are frequent, and not many vessels come here then.

Page 874.—**The Lighthouse** is a white wooden tower 43 ft. high, in lat. 37° 56′ 37″ N., long. 139° 3′ 8″ E.

The outer anchorage is in 7 to 8 fathoms, mud, with the lighthouse bearing between S.E. and S.S.E., about 1 mile distant, but trading vessels go closer in. Ships' boats will find the best landing near the lighthouse.

Page 875.—It is high water, on full and change, at 3h. 17m.; springs rise 1 foot.

Agano or *Aosima gawa* is 2 miles eastward of Shinano gawa.

The coast south-westward of Niegata has now been surveyed. *Kakuta saki*, 15 miles S.W. by W. from Niegata, rises steeply to an elevation of 1,579 feet. Hence the coast trends to S.W. by S. and is backed by hills. At 15 miles from Kakuta saki are the towns of *Izumosaki* and *Amase*, with about 10,000 inhabitants, and petroleum is found in the vicinity, some of the wells being under the sea. At 5 miles farther on is *Kannon saki*, a cliffy wooded bluff, and 7 miles farther is the town of *Kashiwazaki*, at the low northern extreme of a range of hills rising to an elevation of 3,272 ft. at the conical peak of *Yone yama*. *Yone yama saki*, the western extreme of these hills, is a dark rocky cliff, and hence a low sandy coast trends 11 miles to Naoyetsu.

Naoyetsu is situated at the mouth of the *Ara gawa*, which has 4 or 5 ft. water over its bar. It has about 11,000 inhabitants, and considerable trade is carried on, though the sea is nearly always rough. It is connected with the railway system, and about 4 miles up the river is the large town of *Takada*, in the vicinity of which are some productive petroleum wells. Vessels find temporary anchorage in 10 fathoms or less, from 3 cables to 1 mile off shore, but N.W. winds render it unsafe, and vessels then cross over to Sado for shelter. Landing then may sometimes be possible under shelter of a rocky reef at *Gonotsu*, 1½ mile westward of Naoyetsu.

From Gonotsu the general trend of the coast is to W. by S. ½ S., and the land is mostly hilly, with high mountains in the interior. This hilly coast terminates at *Miyazaki hana*, whence a wide cultivated plain extends around the eastern and southern sides of Toyama Bay to Fushiki, with mouths of several shallow rivers.

Fixed fishing nets extend from 1 to 2 miles off shore in the vicinity of Fushiki, and at other places in Toyama Bay, and along the East coast of Noto Peninsula.

Fushiki has about 7,000 inhabitants, and is connected with the railway system; vessels under 7ft. draught can enter the river, but the bar is liable to change. At 4 miles up the river is the city of *Takaoka*. Rice and mats are the chief articles of export. In approaching, *Futakami yama* (933 ft. high, at 2 miles westward of Fushiki) forms a good mark. In approaching the anchorage steer for the lighthouse bearing about S.S.W., and this will lead between two buoys marking the fairway between the fishing nets; anchor when in about 5 fathoms, mud. With strong northerly winds, vessels must run to Nanao North Harbour for shelter.

Northward of Fushiki the eastern shore of Noto Peninsula is hilly, and has but few off-lying dangers.

Pages 875-876.—**Nanao South Harbour.**—The reefs said to lie 5 miles East of the entrance do not exist. Several spar and other *buoys* mark dangers in the entrance channel, which should not be attempted by a stranger without the aid of a pilot. *Miyose Rock* is marked by a *conical black* beacon *buoy*. The town of *Nanao* has about 10,000 inhabitants, and is connected with the railway system. It is high water, on full and change, at 2h. 40m.; springs rise $1\frac{3}{4}$ foot.

Nanao North Harbour has some dangerous sunken rocky patches lying on each side of the entrance, with deep water close to them; and at 2 to $2\frac{1}{2}$ miles farther in are some other detached sunken patches. The chart must be used with due caution, as other dangers probably exist.

Page 876.—*Ogi Harbour*, 10 miles north-eastward of the entrance of Nanao North Harbour, is a narrow inlet, affording shelter to junks. Close northward of it is *Tsukumo Harbour*, where small craft find shelter at all times.

Sudzu misaki, the N.E. extreme of Noto Peninsula, is hilly, and over its eastern point rises *Yamabushi yama*, a conspicuous conical hill 625 ft. high. Reefs extend about half a mile off the northern shore.

Page 877.—**The Lighthouse** on *Rokugo* or *Rokko saki* is a white stone tower, in lat. 37° 31′ 50″ N., long. 137° 19′ E.

In 1907, the steamer *Mikado maru*, drawing $16\frac{1}{2}$ feet, struck on a sunken rock, from which the lighthouse bore S. 50° E. and Izu or Deno saki S. 67° W.

Himesima Reef extends three-quarters of a mile off *Ai saki*.

Yome guri, or *Aroostook Reef*, $10\frac{1}{4}$ miles N.W. by N. $\frac{1}{2}$ N. from Rokugo saki lighthouse, has 6 ft. least water over a small rocky patch, and is always marked by breakers in winter. The reef reported to lie 6 miles to W.N.W. could not be found during the survey, but a patch of 8 fathoms is reported to lie 2 miles West of Yome guri.

Yutsi or *Hegura sima* is a narrow island about 1 mile long, and a sunken reef extends half a mile southward from its South point. The fishermen do not stay here during the winter.

Nanatsu sima consist of two groups of treeless islets and rocks, separated by a deep clear channel $1\frac{1}{3}$ mile wide. *Nana* or *O sima*, 180 ft. high, is in lat. 37° 36′ 45″ N., long. 136° 53′ 20″ E., and some high rocks extend two-thirds of a mile N.W. by W. from it. A patch of 8 fathoms is reported to lie 2 miles E. by N. from it. *Aramiko jima*, $1\frac{1}{2}$ mile S.W. of O sima, is 150 ft. high, and at 1 mile W. $\frac{1}{2}$ N. from it is *Mikuriya jima* 160 ft. high, with several smaller rocks between.

These islets are visited by fishermen in summer, but passing vessels are advised not to approach them within a mile. The reported 3-ft. ledge $2\frac{1}{2}$ miles off Wasima was not found during the survey.

Wasima is a town of over 10,000 inhabitants, 22 miles W. by S. $\frac{1}{2}$ S. from Rokugo saki, where fresh provisions and water may be obtained. *Kosu yama*, 3 miles E. by S. from it, rises to an elevation of 1,780 feet. There is anchorage in 6 or 7 fathoms, about half a mile off the town, well sheltered from southerly and south-westerly winds. The conspicuous white cliff northward of the town has a sunken reef reaching half a mile off.

From Wasima the hilly coast continues 10 miles W.S.W. to *Saruyama saki*, the N.W. extreme of Noto Peninsula, over which rises a conspicuous sharp peak 1,071 ft. high. Here the coast turns sharply southward. *Annyomon guri* is a detached rocky patch of $5\frac{1}{2}$ fathoms lying $2\frac{1}{2}$ miles off shore, in lat. 37° 11′ N.

Matsugashita Bay, in lat. 37° 8′ N., affords sheltered anchorage during northerly and easterly winds, eastward of Ama saki, in 6 to 9 fathoms, about three-quarters of a mile off shore.

Fukura is built around a cove 4 miles south-eastward of Ama saki. On its south-western point is a white wooden building, showing (from March 15 to November 14) a *fixed bright light*, elevated 66 ft., and visible 5 miles.

At *Taki saki*, 9 miles southward of this, the hilly coast ceases, and hence a low sandy shore trends 40 miles S.W. $\frac{3}{4}$ S. to Koshio saki.

Hagui gawa, 1½ mile south-eastward of Taki saki, is a shallow stream, and the railway from the South here turns inland. *Sai gawa*, 19 miles to S.W. by S. ¼ S., is a similar stream.

Kanaiwa is a town of about 7,500 inhabitants on the North side of the Sai gawa, and about 4 miles inland is the city of *Kanazawa*, with about 30,000 inhabitants, on the railway. Vessels anchor off Kanaiwa as convenient, in 6 to 7 fathoms, but it is an open roadstead. Supplies may be had here.

Lights.—A *fixed bright* light, elevated 59 ft., and visible 9 miles, is shown from a white wooden tower at Kanaiwa. At *Ono*, on the South side of the Sai gawa, a *fixed red* light, elevated 79 ft., and visible 6 miles, is shown from a staff.

Tetori gawa, 8 miles south-westward of the Sai gawa, has 6 to 12 ft. water over its shifting bar. Here is the town of *Mikawa*, where supplies of flour, fish, vegetables, firewood, and water may be had. Vessels find anchorage about 1 mile off shore. *Ataka gawa*, 5 miles farther on, is shallow; at 2 miles up it is the town of *Komatsu*, where supplies may also be obtained.

Koshio saki is a rocky point covered with pine trees. At 4½ miles S.W. of it is the *Daishoji gawa*, with the village of *Shioya* on its eastern bank.

Ando saki is 6½ miles W.S.W. of Shioya, the intervening coast being low and sandy. The point is thickly wooded, and 1 cable off it lies a wooded islet 100 ft. high. About 12 miles inland, to E.S.E., is *Fujiutsushi yama*, a conspicuous triple peak 3,075 ft. high; farther eastward is *Haku san*, a snowy peak 8,855 ft. high, seldom visible.

In 1894, some fishermen reported a narrow reef, about 6 miles long North and South, with 4 to 17 fathoms over it, and very deep water close-to, at about 24 miles north-westward of Ando saki, or in lat. 36° 30′ N., long. 135° 45′ E. It has been searched for without success.

Gentatsu Shoal, with 5¼ fathoms least water over it, and 15 to 80 fathoms around, lies 20¾ miles West of Ando saki.

Mikuni.—At 2 miles S. by E. from Ando saki is the *Kutsuryu gawa*, where a breakwater has been constructed from the northern point, but only small vessels can enter. Boats can ascend the river for 10 miles, to the town of *Fukui*, on the railway. To reach the outer anchorage steer E.S.E. for the breakwater, and anchor in 6 fathoms, with O sima bearing North. It is high water, on full and change, at 2h.; springs rise about 2 feet.

Southward of Mikuni is a wide sandy plain, followed by a hilly coast, fronted by scattered rocks.

Yechizen saki, the eastern point of Wakasa Bay, is a sharp cliffy projection, with a clump of trees on it. Here the coast turns to the S.S.E., mostly cliffy, backed by wooded hills.

Pages 877-878.—**TSURUGA BAY** is 6½ miles in extent North and South, and from 1½ to 4 miles in width, with cliffy shores interspersed with gravel beaches. The head of the bay is mostly low and sandy, and at 4½ miles inland to south-westward is the conspicuous peak *Nosaka yama*, 2,786 ft. high.

Page 878.—**Tateishi saki** is the northern extreme of a mountainous peninsula, which rises to an elevation of 2,473 feet. The *lighthouse* on it is white; the light elevated 397 feet, and visible 15 miles; lat. 35° 45′ 45″ N., long. 136° 0′ 45″ E.

Tsuruga contains about 16,000 inhabitants, and is connected with the railway system, the line now passing around Lake Biwa. A regular line of passenger steamers connects it with Vladivostok, in connection with the Siberian railway route to and from Europe. Vessels drawing up to 25 feet can lie close off the railway wharf northward of the town; large vessels anchor 3 or 4 cables westward of the wharf, in 11 or 12 fathoms. It is high water, on full and change, at 0h. 35m.; springs rise one foot.

Wurasuga Bay is now named *Urasoko*.

The Coast, between Tateishi saki and Ohama Harbour, 21 miles to S.W. by W., is much indented, but the numerous bays are not suitable anchorages. *Tsunegami saki*, the extremity of a projecting peninsula, is 690 ft. high, and close westward of it lies *Ongami sima*, with a conical peak 550 ft. high, and some rocks in the channel between. *Matsuga saki*, the eastern point of Ohama Harbour entrance, is cliffy, and 2 miles eastward of it *O yama* rises to an elevation of 2,028 ft., an excellent landmark.

Ohama Harbour entrance, in long. 135° 40½′ E., is 1¼ mile wide, with depths of 15 to 20 fathoms. The harbour is nearly 10 miles in extent East and West, by 3 miles in greatest breadth, with regular depths of water, affording excellent sheltered anchorage. The towns of *Ohama* and *Nishizu*, with about 20,000 inhabitants, are situated on either side of the river which runs into the S.E. part of the bay. Good water can be

had here. There is a dry dock at Ohama, 250 ft. long, with an entrance 37½ ft. wide, having 12 ft. over the sill at high water springs.

Takahama Bay, next eastward of Ohama Harbour, is exposed to northerly gales, and not recommended for anchorage. *Asa guri* is a dangerous isolated rock of 3 fathoms, with 27 to 40 fathoms close around, at 5¾ miles N.W. ½ N. from Nokogiri saki, the eastern point of Ohama Harbour entrance. A 6-fathoms patch lies about midway between it and the shore to S.E. by S. ½ S.

Uchimi Bay, 8 miles westward of Ohama Harbour, affords good sheltered anchorage in 6 to 15 fathoms, sand and mud. Hence to Maizuru Harbour the coast is much indented, with several off-lying islets and rocks.

MAIZURU HARBOUR, 16½ miles westward of Ohama Harbour, is a curious landlocked inlet, in the southern angle of which is a government dockyard, connected with the railway system, and vessels are not allowed to enter without permission. The entrance varies from a third to half a mile in width, and is 2 miles in length, with depths of 13 to 16 fathoms; the harbour then branches into two arms, each about 3 miles in extent, with depths under 10 fathoms. It is high water here, on full and change, at 2h. 40m.; springs rise 2½ feet.

It was intended to construct three dry docks here, the largest 538 ft. long, with 37 ft. over the sill at ordinary tides.

A *fixed red light*, visible 3 miles, is shown from a beacon on a groin, on the eastern side of the harbour, off the river entrance northward of the town.

Kunda Bay, close westward of Maizuru Harbour, affords sheltered anchorage in its N.W. angle, except with easterly winds. The *Yura gawa*, only navigable by boats, runs into the southern part of the bay. The bottom of the bay is muddy, good holding ground.

Miyadsu Bay.—*Kuro saki*, the eastern point of the entrance, is thickly wooded, and easily distinguishable. On the opposite side is *Hioki saki*, North and South of which two continuous measured distances of 1½ and 1 mile respectively are marked by beacons.

Page 879.—**Kamurisima**, 9½ miles N.E. by E. ¾ E. from Kuro saki, is two-thirds of a mile long, wooded, and 378 ft. high, with cliffy shores, and a temple on its S.E. side; a rocky reef of 1 to 3 fathoms extends 1¼ cable S. ⅔ E. from its South point. At 1⅓ mile to N.E. by N. ½ N. from Kamuri, with some sunken rocks in the channel between is *Okino sima*, half a mile long, and 260 ft. high, with a 3½-fathoms reef half a mile N. by W. from its North end.

KYOGA MISAKI, the western extreme of Wakasa Bay, is a bare point with a conspicuous conical peak 715 ft. high south-eastward of it.

The Lighthouse on Kyoga misaki is a white stone tower 29 ft. high, showing a *triple-flashing bright* light every 20 *seconds*, elevated 473 ft., and visible 29 miles. Lat. 35° 46′ 45″ N., long. 135° 13′ 10″ E.

The Coast from Kyoga misaki trends about 90 miles westward to Miho Bay, forming a slight curve, with but few off-lying dangers. For the first 50 miles it is mostly steep, with precipitous hills, but beyond that the coast has a low sandy or hingly shore.

Inu saki, 4½ miles westward of Kyoga misaki, is a round hill 811 ft. high, and at 3 miles farther westward is the village of *Taiza*, on a projecting point. *Kumihama Inlet*, 11 miles farther on, is a lagoon with depths of 5 to 11 fathoms in it, but the narrow entrance will only admit boats. Between this and Tsuiyama Harbour, 3 miles westward, the coast is fronted by several off-lying sunken rocks, of which *Takeno guri*, the outermost, has 10 ft. over it, with 20 fathoms close around, at 1 mile off shore.

Tsuiyama Harbour, in long. 134° 50′ E., is a small shallow bight, the mouth of the *Maruyama gawa*, at 5 miles up which is the town of *Toyooka*. *Neko saki*, 3 miles westward of Tsuiyama, is 472 ft. high, with a clump of trees on it, and was once an island.

Shibayama Harbour, 4½ miles westward of Neko saki, is a narrow inlet, only fit for small vessels, and a swell rolls in with northerly winds. The land around is wooded and mountainous.

Amarube saki, 6 miles westward of Shibayama, is a thickly wooded headland, 886 ft. high, with two conspicuous peaks 3½ miles S.S.E. from it. At 5 miles westward of it is the village of *Hamasaka*, and 8½ miles farther on is a shallow bight, *Otami Bay*.

Sendai gawa is 5 miles westward of Otami Bay, and is navigable by small vessels up to the town of *Tottori*, about 3 miles from the mouth, at which is the large village of *Karo*. The coast hereabout is low and sandy, and at 9 miles westward of the river is *Nagao bana*, a grassy point 273 ft. high. For 7 miles farther westward the coast is mostly cliffy, and then sinks to a low sandy shore, with the mouths of several streams.

Mikuriya saki, the eastern point of Miho Bay, is low with a village on it, but at 9 miles to S. ¾ E. the mountain *Tai san* rises to an elevation of 5,664 feet.

MIHO BAY, or Miku ura, is 9 miles in width between Mikuriya saki and Jizo saki to W.N.W., with regular and moderate depths of water, bottom of mud and sand. It is only open to easterly winds, and affords good anchorage, the best being in 6 to 12 fathoms, off the northern shore. Its shores are mostly low and sandy, and in its N.W. angle is *Sakai Harbour*, the entrance of a narrow shallow channel, leading to a large lagoon named *Naka mi*. The town of *Sakai* has upwards of 50,000 inhabitants, and is being connected with the railway system.

Light.—On the North part of the old fort at Sakai stands a white wooden tower 30 ft. high, showing a *fixed bright* light, elevated 50 ft., and visible 6 miles.

JIZO SAKI, the eastern extreme of a narrow hilly peninsula, has some rocks lying a cable off it, and at 1¾ mile to N.E. ¼ E. is *Okinoyozen jima*, 25 ft. high, with a sunken rock 1 cable N.E. of it.

The Lighthouse on Jizo saki is a white stone tower 23 ft. high, showing a *revolving bright* light every *half-minute*, elevated 273 ft., and visible 23 miles seaward between N. 60° W. and S. 57° W.

Page 879.—**OKI ISLANDS,** northward of Miho Bay, cover an extent of 25 miles N.E. and S.W. *Dogo* or *Oki sima* rises to an elevation of 2,030 ft., near its eastern side. *Saigo Harbour* has a large village, connected with the mainland by a telegraph cable; fish and fresh water may be had here. It is high water, on full and change, at 2h. 4m.; springs rise 15 inches.

Dozen is the southern group of Oki sima; there are anchorages in the passages between them. *Nishi no sima*, the eastern and largest island, rises to an elevation of 1,463 ft. near its North point; *Naka no sima*, the eastern island, is 755 ft.; and *Chiburi sima*, 1,058 feet. Several high islets and rocks lie off the N.E. side of Naka.

The Coast, from Jizo saki, trends 36 miles westward to Hino misaki, and is generally rocky, the land rising steeply from the sea. Small vessels find shelter from north-westerly gales in *Shichirui ura*, a small bay 3½ miles westward of Jizo saki; *Takao yama*, 1,095 ft. high, rises over the bay, forming a good mark for it. At 5 miles farther westward is *Kasa ura*, where small vessels find shelter under a narrow peninsula.

Kaka or *Kaga ura*, 5 miles westward of Kasa ura, is mostly occupied by a group of islets, north-eastward of which there is sheltered anchorage for small vessels, in 5 to 13 fathoms. *Yezumi ura*, 4 miles farther westward, is open to the N.W., but affords anchorage with off-shore winds; large boats can ascend the river running into it, and reach *Shinji Lake* in the interior.

HINO MISAKI and Lighthouse.—This point terminates in a sharp cliff, and on its northern side stands a white stone tower 128 ft. high, showing a *group-flashing* light every 20 *seconds*, thus:—*two bright* flashes in 3½ seconds, interval 8 seconds, a *red* flash, and then another interval of 8 seconds; it is elevated 208 ft., and visible 21 miles seaward from S. 29° W. to N. 70° E. Lat. 35° 26′ N., long. 132° 37′ 30″ E.

Tomo sima, a small islet 32 ft. high, lies about 7 cables westward of Hino misaki with many sunken rocks between.

Southward of Hino misaki is a wide plain, on the North part of which, at 3 miles from the cape, is the village of *Kizuki*. *O saki*, 17 miles S.W. of Hino misaki, is a wooded point with some large rocks off it, and at 7 miles farther on is *Kunotsu ura*, where are some hot springs. *Sotono ura*, 17 miles south-westward of this, is a narrow inlet, affording perfect shelter to junks and other small vessels.

HAMADA BAY, close S.W. of Sotono ura, is about 2 miles in extent, being sheltered on the North by a group of islets and rocks extending 1½ mile off shore. The only danger in entering is *Shakkuri sho*, a 7-ft. sunken rock, lying 4½ cables N. by E. ¾ E. from Kuro saki, the S.W. point of the bay; it is marked by a *red* cask *buoy*. The town of *Hamada*, with about 10,000 inhabitants, occupies the N.E. shore of the bay, and off it there is anchorage in 6½ fathoms, mud, with Tsuru sima bearing E. by N. With strong westerly winds, there is better shelter off *Nagahama*, the town in the S.W. angle. It is high water, on full and change, at 0h. 17m.; springs rise 1¾ foot.

Light.—*Uma sima*, the outer islet, is 203 ft. high, and on its western extreme stands a white tower 25 ft. high, showing a *double-flashing* light every 15 *seconds*, thus:—two flashes in 4 seconds, and then an interval of 11 seconds; it is *bright* from S. 1° W. to S. 22° W., *red* thence to S. 27° W. over Shakkuri sho, and *bright* thence to N. 55° E. The light is elevated 109 ft., and visible 16 miles.

From Hamada Bay the hilly coast continues south-westward, fronted by numerous islets and rocks. *Taka sima*, 4½ miles N.W. by N. from the cliff of Kannon bana, is about half a mile long, and 395 ft. high, and is inhabited.

Port Yesaki, 26 miles south-westward of Hamada, is a narrow inlet, where small craft find sheltered anchorage in 3 to 4 fathoms.

Koyama or *Takayama misaki*, or *Cape Louisa*, is 1,730 ft. high, and it is fronted by numerous islets and rocks; *Yama sima*, 182 ft. high, the largest, lies 6 cables off shore, and eastward of this are *Yotsu se* or *Aston Rocks*, nearly 100 ft. high, about the same distance off shore.

Port Susa, on the S.W. side of Koyama misaki, is an inlet about 1 mile in length, affording sheltered anchorage for vessels of moderate size, and there is a town around its S.E. angle. There are some islets and reefs on each side of the entrance.

Between Koyama misaki and Kawajiri misaki, 35 miles to W. by S. ½ S., the hilly coast forms a large bay, the shores of which are much indented, and fronted by numerous off-lying islands and rocks. In the S.E. angle of the bay is the town of *Hagi*, with about 20,000 inhabitants, where fresh provisions and water can be obtained; there is good anchorage off it in 10 fathoms, except during N.W. gales.

Setozaki Harbour, 8½ miles westward of Hagi, is sheltered by the off-lying range of islands, within which there is secure anchorage, bottom of mud and sand. It is high water, on full and change, at 10h. 30m.; springs rise 4½ feet.

Kawajiri misaki is a steep wooded cliffy point 280 ft. high.

MINO SIMA, 20½ miles N.E. by N. ½ N. from Kawajiri misaki, is 2½ miles in extent North and South, and 575 ft. high. There are villages on its N.E. and South sides, the population numbering over 1,300. There is an invariable easterly stream near Mino sima, sometimes running 2½ knots an hour.

Page 880.—**Ai sima,** the outermost of the off-lying islands, is 1 mile in extent, with a flat summit 500 ft. high. Its shores are precipitous, with off-lying rocks. There is a village on its South end. *O sima* is 350 ft. high, and has a large village on its South side.

Aomi sima, sheltering Setozaki Harbour, has a conspicuous conical peak 1,045 ft. high near its West end. *Fukawa Bay*, westward of it, affords anchorage except during northerly winds.

Aburatani or *Igama Bay* is 1¾ mile wide at its entrance, between the rocks on either side. *Kawara ura*, its eastern angle, has depths of 5 to 8 fathoms, but is exposed to westerly gales.

Tsuno sima Lighthouse is a white tower 86 ft. high, in lat. 34° 21′ 30″ N., long. 130° 50′ E.

Page 881.—From Aburatani Bay the coast trends 24 miles southward to the western entrance of Simonoseki Strait, and is rocky and mountainous as far as Murotsu saki; southward of this the land becomes lower, and is well cultivated.

Kanda misaki, 5 miles S.S.W. of Aburatani Bay, is a low point, with 9-ft. shoal off it, and between this and Murotsu saki the coast forms a bay 8½ miles wide, in the southern part of which are some off-lying islets and rocks. *Murotsu saki* rises in a wooded peak, and southward of it is *Kannon saki*, a steep bare headland, above which rises a double-topped hill 988 ft. high. Hence to Simonoseki Strait, the coast is fronted by rocks and shoals, as shown on the chart.

Futaoi sima.—See the Addenda for page 790.

Page 881.—**OKI NO SIMA or Kotsu sima Light.**—In 1906, a *fixed bright* light, elevated 816 ft., and visible 8 miles, was shown from a mast on the summit. Lat. 34° 14′ 35″ N., long. 130° 6′ E.

In October, 1907, a sunken 9-ft. rock was reported at half a mile S. 7° W. from the lighthouse, and lying on the shoal extending southward from Oki no sima.

Oro no sima, 35½ miles W. ⅞ S. from North Siro sima, is in long. 130° 2′ E., and is 359 ft. high.

Katsuri saki is now known as *Tateno misaki*.

Page 882.—*Tatchi yama* is 1,241 ft. high; the railway runs near the shore.

Aino or *Ai sima* is 7¾ miles S.S.W. from O sima or Wilson Island.

Kuro no kami Rocks lie 5½ miles from Aino sima, and 12 miles from Oro no sima; they rise from 1 to 6 ft. above high water.

Nagamo or *Ellis Reef*, 8½ miles East of Yebosi sima, and 3½ miles W. ⅔ N. from Too-dai Rock, dries 2 ft. at low water. The rocky patch to S.S.E. has a least depth of 3 ft. on it.

Todai se or *Nooze Reef* dries 4 ft. at low water.

In 1898, a sunken rock was reported to lie about 5 miles north-eastward of Yebosi sima, but it was afterwards carefully searched for in vain. The fishermen also say there is no rock hereabout, but a tide-race is sometimes seen northward of Yebosi.

Pages 882-883.—**FUKUOKA WAN, or Hakosaki Bay.**—*Shika* or *Siga sima*, 645 ft. high, is connected with the shore by a dry spit. *Noko no sima* is 700 ft. high. The railway connecting Moji, Nagasaki, &c., passes near the city of *Hakata*, which contains over 70,000 inhabitants. It is high water here, on full and change, at 9h. 4m.; springs rise 7¼ ft., neaps 4½ feet.

It has been proposed to construct a harbour on the northern shore of the bay, opposite the city.

Page 883.—**Karatsu no ura.**—The railway from the coal mines is brought down to wharves on the western side of *O sima*. Vessels shipping coal anchor in *Tobo Bay*, westward of that island, in 6 fathoms or less as convenient, but exposed to north-easterly winds. In 1906, the vessels entering numbered 341, with a tonnage of 250,203; the exports, mostly coal, were valued at £214,917.

IKI SIMA.—The N.E. hill is 562 ft. high. In entering *Go no ura*, give Hira sima a berth of at least a mile to avoid the sunken rock S.E. of it. Telegraph cables from Fusan and Tsu sima are landed here, and three cables run to Yobuko. It is high water here, on full and change, at 9h. 30m.; springs rise 7⅓ ft., neaps 5 feet.

Page 884.—**Light.**—Several small islands lie close together off the North end of Iki sima. A *fixed red* light, elevated 351 ft., is shown from a mast on *Wakamiya*, visible 6 miles northward between W.N.W. and S. ⅓ W. In the offing, the flood stream runs eastward 2½ knots an hour, and the ebb westward 3¼ knots.

Kame se, with 2¼ fathoms over it, lies 7 cables N. ¼ E. from the western *Izumi Islet*; *Kabu se*, with less than 6 ft., lies 9 cables S.S.E. from the same. *Baku se*, with 10 ft. over it, lies nearly 1⅔ mile S. by E. ¾ E. from *Megame*, the southernmost islet of Na sima.

Oogawa sima is 1½ mile eastward of Kagara.

Pages 884-885.—**YOBUKO HARBOUR.**—Three telegraph cables are landed southward of Taka sima, the *light* on which is obscured southward between S. 66° E. and S. 44° W. A 4½-fathoms patch lies 4 cables S.E. ¼ S. from Taka sima, and one of 3 fathoms at 3 cables N.W. ⅔ W. from that islet.

Page 885.—*Tozin se* is a dangerous pinnacle rock with 6 ft. water over it, at 1½ mile S.W. by S. ¾ S. from Hato saki.

Moko sima is 230 ft. high. A 7-ft. sunken rock lies 4 cables S. ¾ W. from the South point.

IMARI GULF—*Kuro sima* is 317 ft. high. The islet 4 cables N.E. of Awasi sima is 145 ft. high. A 3½-fathoms patch lies 4¼ cables N.W. of Tsu or Hosika saki.

Page 886.—**Imari** is connected with the main line of railway by a branch line.

Taku or *Do sima*.—*Tako se*, of 2¼ fathoms, lies 1¼ mile N.E. of the N.E. end, and a patch of 4½ fathoms lies in mid-channel off the North end of the island. Other dangers may exist in the channel between Taku and Atsusi no O sima.

Page 887.—**HIRADO SIMA**.—There is a *Signal Station* on the peak of *Shijiki* or *Sisiki saki*, the South extreme.

Page 888.—**HIRADO NO SETO.**—*Sylvia Rock* dries 1 foot. The patch half a cable eastward of *Ootaske* Rock has 2½ fathoms least water. *Kotaske Rock* dries 9 feet. *Asama Shoal* has 7 ft. least water. *James Rock*, or *Mutsu se*, dries 5 feet.

Page 889.—*Ho-age* or *Sail Rock* is 77 ft. high.

Tides.—It is high water at Hirado, on full and change, at 8h. 52m.; springs rise 10¼ feet, neaps 6½ feet. The tidal streams run strongest in the narrows at the North end of Hirado no seto.

Gai Shoal, westward of Saracen Reefs, has a least depth of 3¾ fathoms over it, at 3¼ miles S.W. by W. from Kuro sima.

Pages 889-890.—**Odate** or *Oo tate sima.*—*Iro se Islets*, 8 cables to N.W. by N., are 49 ft. high. The rock awash reported to lie half a mile to N. by E. ½ E. was not found when searched for. *Ko tate* is 168 ft. high, and a 3½-fathoms rock lies 3½ cables E.N.E. of it.

Light.—On Odate sima stands a white iron tower 25 ft. high, showing a *flashing* light every 10 *seconds*, elevated 267 ft., and visible 23 miles; showing *red*, over the islets, between N. 27° W. and N. 43° W., and between S. 36° E. and S. 61° E., and *bright* elsewhere.

Page 890.—**Fuku se**, 3½ miles N. 13° E. from the lighthouse, and 2¾ miles S.S.E. from Ho-age or Sail Rock, is now marked by a *conical* buoy, *red* and *black bands*, with

staff and *ball*, northward of it; the *beacon* (which showed an unattended *fixed bright light*) has been washed away by the sea, but is now being rebuilt.

Sakito or *Mikoto sima* is 4¾ miles E. by S. from Odate.

Oo seto, the passage eastward of Oo sima and the adjacent islands, is deep, but a 3-fathoms patch lies in the fairway of the narrows. Strangers are recommended not to use it without a pilot.

Shira se Light.—On Shira se stands a white stone beacon turret 12 ft. high, showing an unattended *fixed* light, elevated 46 ft., and visible 6 miles; *bright* northward between West and East, and *red* southward.

A 2-fathoms patch lies 7 cables S.E. by E. from the light.

At 2 miles East of Shira se is the entrance of a deep channel, half a mile wide, leading to a spacious landlocked irregular basin, 5 or 6 miles in extent, the shores of which are deeply indented by numerous bays and inlets. The northern inlet, at the head of which stands Saseho, is somewhat obstructed by reefs on its eastern side, within which is a sheltered basin about 1 mile in extent with regular depths of 5 to 6 fathoms.

SASEHO, or Sasebo, is a town of about 30,000 inhabitants, dependent upon the naval arsenal and dockyard which the Japanese have formed here, and which proved of such great service during the recent war with Russia. It is connected with the main line by a branch railway. The arsenal is replete with every requisite for the repair of hull and machinery, and for fitting out war-vessels. There are two dry docks, the larger one being 442 ft. long, with an entrance 98½ ft. wide, having 31½ ft. over the sill at high water. Another dry dock is now approaching completion; it will be 538 ft. long, with 38 ft. over the sill. A pontoon dock can raise weights up to 1,500 tons. A large naval hospital is maintained here. Inferior coal is mined in the surrounding region.

Directions.—Vessels are not allowed to approach Saseho without the consent of the authorities; there are signal stations on Kogo saki and Tatekami saki, with which they can communicate by signal. In approaching pass about half a mile northward of the lighted beacon on Shira se; two white beacons, on the East side of the entrance, in line N.E. by N., will lead southward of the reef extending 4 cables southward from *Kogo saki*, the western point of the entrance.

OMURA BAY is connected with the southern extreme of Saseho Inlet by a narrow deep winding channel. The bay is really a great salt lake 18 miles in extent N.W. and S.E., with regular depths of 11 to 13 fathoms over its central part. The railway from Nagasaki skirts its southern and eastern shores.

Page 890.—**Matsu sima** has islets and rocks extending 1⅓ mile northward from its N.W. point. The coal mines are still worked.

Ohiki or Hiki sima is 9 cables long. *Ike sima* is 369 ft. high.

Ori se, a sunken 6-ft. pinnacle rock, lies 8 cables W. by N. from Noo se Rocks, on the North side of the entrance to Miye no ura.

Page 891.—**GOTO ISLANDS** are connected with each other, and with Kiusiu, by telegraph cables.

Koshiki sima Light.—On the central islet of the Koshiki or Koshi no se stands a white wooden tower 22 ft. high, showing a *revolving bright* light every *half-minute*, elevated 212 ft., and visible 16 miles. It is situated in lat. 33° 18′ 15″ N., long. 129° 10′ 15″ E.

Ojika seto is deep, but the meeting of the flood streams in its western entrance causes heavy tide-rips. It is high water hereabout, on full and change, at 8h. 40m.; springs rise about 10 feet.

Page 892.—**SHIRO SE Lighthouse** is a square white wooden building 15 ft. high, showing a *fixed* light, elevated 115 ft., and visible 11 miles; *red* from S. 45° W. to S. 67° W., over Korai no se; *bright* thence to N. 75° E.; *red* from N. 75° E. to N. 88° E., over Hoage Rocks; and *bright* thence to S. 45° W.

Shaku shi lies 4¼ cables N. ½ E. from Shiro se.

Korai no se lies 6 miles S.W. ¾ W. from Shiro se, and has 2¼ fathoms least water over it.

Page 893.—**Oso ura,** next south-westward of Nama ura, is sheltered by Siuge and Ore sima; the latter has foul ground reaching 4 cables north-eastward from its N.E. end, narrowing the entrance. There is anchorage in 10 fathoms or less in either inlet of the bay.

Hira sima.—A 3½-fathoms rock lies about a quarter of a mile westward of the South point of *Komoda Bay.*

Page 894.—**Naru seto.**—A sunken 9-ft. rock lies nearly half a mile N.E. of Gunn Rock.

Kaba sima is the largest of a group of islands south-eastward of the Naru seto, rising to an elevation of 1,061 ft. in its northern part. At 2½ miles S.E. by S. ¼ S. from its S.E. point is *Kadonoso ne*, an isolated patch of 5½ fathoms, with very deep water close around.

Tanno ura seto.—Vessels should always pass westward of Tatara sima, and, with the ebb, must beware of being swept northward of that island.

FUKAI SIMA is 15 miles in extent.

Page 897.—**Hime sima** is nearly 1¼ mile N.N.E. of the N.W. point of Fukai sima.

Page 898.—**DANJO or ME SIMA** lie between S.E. ⅓ E. and S.E. by S., distant 18 to 21 miles from Pallas Rocks.

In May, 1905, the captain of the steamer *Thomas Turnbull* reported having at dusk passed close to a very narrow reef 200 ft. long, about 10½ miles south-eastward of Me sima, or in lat. 31° 49′ N., long. 128° 28′ E.; no soundings were taken, but a smell of seaweed was observed. In 1907, a thorough search by Japanese officers failed to find any trace of it, a depth of 107 fathoms, sand, being found in the reported position.

Page 898.—**NAGASAKI BAY.**—On the coast near *Miye no ura* are some *beacons* marking a *measured* distance of 3½ miles.

Page 899.—**Fukuda saki** terminates in a remarkable white cliff, within which it rises to an elevation of 613 feet. *Nikko se*, 11 cables W.S.W. of it, is a rocky patch of 5½ fathoms, with 7 to 15 fathoms close around.

Sunken rocks extend 1½ cable off the point N.N.E. of Fukuda saki. *Okino kajikake*, or *Teazer Rock*, dries one foot at low water.

Io or *Iwo sima* rises to an elevation of 352 ft. near its S.E. end. There is now no signal station on *Signal Head.* The boat channel between it and Oki sima dries at low water. *Onaka seto*, the channel between Oki and Koyagi, is 1 cable wide between the reefs on either side, with depths of 12 to 15 fathoms.

Oki sima is 486 ft. high at its southern end.

Hira se.—The *beacon* is painted *red.*

Sotonohira se rises 3 ft. above high water, and foul ground extends a cable N.N.E. from it. *Koyakidashi*, 3½ cables to N.W. ¾ W., has 4½ fathoms over it, with 6 to 15 fathoms close around.

Kutsno or *Kuchino se* is 17 ft. high, and *Kuro se* 5 feet.

Tobi sima, 2 cables off the N.E. side of Taka sima, is 142 ft. high, and a sunken rock lies 1 cable outside it. *Futako sima* are about 128 ft. high.

Taka sima.—There are two conspicuous high chimneys at the collieries, forming a good landmark. The output of coal has recently fallen off, though the best quality of bituminous coal found in any part of Japan.

Page 900.—**Nakano sima** is 1¼ mile S. by W. ¼ W. from Taka sima; and *Ha* or *Hi sima* is half a mile S.W. of Nakano. Good coal is found on both these islands, but only that on the latter is now worked.

Mitzu se cover an extent of about three-quarters of a mile. *Asazo ne*, with 3½ fathoms, lies about half a mile eastward of them. At night, these dangers will be avoided by keeping Io sima light in sight.

The West Coast of Nagasaki Peninsula should be avoided, vessels being recommended to pass westward of Taka sima and Mitzu se. *Kawara yama*, 8 miles north-eastward of Nomo saki, is 1,973 ft. high, with a beacon on it.

Page 901.—**Koyagi,** or *Koyaki*, is 392 ft. high, and coal is found on it. *Koyagi seto*, the channel eastward of it, is encumbered with shoals, and only fit for small vessels with local knowledge. Some of the dangers are marked by stone *beacons.*

Naginata or *Hungry Rock* is marked by a *black* and *white* pole *beacon*, with a *diamond* top-mark. Within 1¼ cable eastward of it is *Hyu se*, marked by two pole *beacons* on its eastern side.

KAGENO Lighthouse is white, and the light is obscured over Hira se, southward of N. 77° W.

Kamino sima is 318 ft. high. *Nakano* or *Aino sima* is 55 ft. high; *Matsu sima*, half a mile N.W. of Shiroga or Siro sima, is 85 ft. high.

Barracouta Rock, or *Kajikake*, dries 3 feet.

Pages 901-902.—**Takaboko** is fortified, and should not be approached within a cable.

Page 902.—**Swinger Rock,** *Hando* or *Karakasase*, lies 2½ cables S.E. by S. from Nezumi sima.

Oso ne is a rocky ridge of 3¾ to 7 fathoms, 1½ cable in length, lying in the fairway, at 5½ cables E.S.E. of Takaboko. A *conical buoy*, *red* and *black bands*, with staff and *ball*, lies northward of the shoalest part.

Pages 902-903.—**NAGASAKI HARBOUR** entrance is 2½ cables wide between Megami and Ko or Ogami saki. The upper part of the harbour has been much improved by dredging, and large areas of land reclaimed from the sea, for the construction of wharves and buildings. There are large numbers of mooring buoys, on some of which *lights* are shown when required.

The harbour is divided into three districts for anchorage. The upper part, northward of a line N. 60° W. from the beacon at Kosuge Creek entrance, is reserved for vessels of and under 500 tons register. The central part, bounded southward by a line N. 69° W. from Megami bana beacon to Kosaki bana, is for war-vessels. The outer part is reserved for vessels of over 500 tons, and all those with explosive or inflammable cargo.

Vessels arriving between sunset and sunrise must anchor outside the harbour, only regular mail steamers and liners being allowed to enter at night.

The *quarantine station* is on Megami Point, and all vessels entering are first visited here. *Megami Point* has a *signal station* on it.

Pages 903-904.—**NAGASAKI** contained 169,899 inhabitants in 1907, including about 500 Europeans and 950 Chinese. It is now connected with Moji by railway, and numerous lines of steamers call here regularly. In 1906, the vessels entering numbered 1,215, with a tonnage of 2,697,029. The exports, chiefly fish, coal, rice and other grain, and timber, were valued at £562,862, while the imports, chiefly coal, petroleum, metals, machinery, and manufactured articles, amounted to £1,391,684. Spacious warehouses are being provided on the land reclaimed at the head of the harbour, and here is the railway terminus. Cargo is loaded or landed by means of lighters.

Fresh provisions are plentiful, but ships' stores are dear; the city has now a plentiful supply of good water, which is brought off in tank-boats. Welsh and other coal is stored in large quantities, and can be rapidly supplied at moderate prices.

The Mitsu Bishi shipbuilding and engineering works are provided with the most modern electrical and hydraulic appliances, for the building and repair of vessels and machinery of the largest dimensions, including turbine engines. There are three dry docks, the largest being 722 ft. long, and 96½ ft. wide at the entrance, with a depth of 34½ ft. at high water springs; the two others are 526 ft. and 375 ft. long, with 26½ ft. and 22 ft. over the sills, respectively. A patent slip can raise weights up to 1,200 tons. Powerful steam-tugs are available, but they only come off when ordered.

Lights.—A small *red* light is shown on the custom-house pier, and another on the consulate pier north-eastward of it.

Page 904.—*Time Signal.*—At the Observatory, a white flag with a red border is hoisted at 11h. 50m., and dropped at noon Japanese mean time (long. 135° E.), equivalent to 3h. a.m., G.M.T. It must not be relied on.

The observation spot at *Minage Point* is in lat. 32° 44′ 14″ N., long. 129° 51′ 13″ E., the latter determined telegraphically.

The Climate of Nagasaki is healthy, and it is resorted to in winter by European merchants from China as a sanitarium. During a series of 10 years observations, the thermometer varied between extremes of 98° F. in August and 23° in February. The average annual rainfall is 72 inches, mostly falling from March to September, June being the wettest month (10¼ inches). The prevalent winds are northerly, but it is often S.W. in June, July, and August. Fog is very rare.

Storm and *Weather Signals* (see Addenda for page 781) are shown on a red and white mast in front of the Government buildings near Desima.

Page 905.—**Pilotage** is not compulsory, but strangers are advised to employ a pilot; their boat carries a red and white striped flag, or a *bright* lantern light, and will be met with by day near Io sima, in fine weather. They only come off at night, if ordered in advance.

Tides.—It is high water at Nagasaki, on full and change, at 8h. 14m.; springs rise 11¼ ft., neaps 7¼ feet.

DIRECTIONS.—In approaching Nagasaki from sea, the best landmarks are the high land of Io sima, Nomo Point, and Kaba Island, with the beacon on Kawara yama. The tall colliery chimneys on Taka sima, and the white cliff of Fukuda Point, are also conspicuous.

Signal Head light is visible over Koyakidashi Rock, of 4½ fathoms.

Page 906.—The telegraph cables from Shanghai, Formosa, and Korea are laid along the fairway northward of Io sima, and to avoid injuring them vessels are forbidden to anchor westward of the meridian of Takaboko.

Page 906.—**East Coast of Nagasaki Peninsula.**—A *measured* distance of 10 miles is marked by *beacons*, at intervals of 3⅓, 2⅓, and 4⅓ miles.

Page 907.—**Kuni saki,** 7½ miles S.E. by S. from Make sima, is a rocky projection 227 feet high; the coast between them forms a deep bay, open to the S.W.

SIMABARA GULF extends in a curve for 47 miles, the breadth varying from 5 to 12 miles. In its lower and central parts it has but few off-lying dangers, but for 14 miles from its head it is mostly occupied by shoals reaching off wide flats. *Uzen* or *Unzen dake* volcano is 4,418 ft. high, and the peak eastward of it 2,734 feet. Strangers bound to Kuchinotsu, or other ports in it, should employ a pilot from Nagasaki.

Hayasaki Channel is deep, but the tidal streams run from 4 to 6 knots an hour at springs, causing strong whirls and races in the main channel between the North point and Gotsu Reef.

Gotsu Reef Light.—Gotsu Reef is 1⅓ mile North of Tsuji sima, and foul ground extends 4 cables southward of it, leaving a channel less than 4 cables wide between it and the reefs off Tsuji. On the reef stands a *red* concrete *beacon*, showing an unattended *fixed red* light, elevated 32 ft., and visible 7 miles.

Kuchinotsu Harbour is a narrow inlet with depths of 5 to 8 fathoms, affording good shelter for small vessels, but during a typhoon in 1895 five steamers were driven ashore. There is good anchorage outside, in 10 fathoms, mud, with fair shelter except during strong southerly winds. At present it is of considerable importance, as a shipping port for Miike coal, towed hither in lighters, but harbour works are in progress at Omuta, nearer the mines, on the East side of the head of the gulf. In 1906, the vessels entering numbered 317, with a tonnage of 595,773; the exports, mostly coal, were valued at £444,708.

In 1907, a shoal of about 2¾ fathoms, mud, was reported to lie 3 miles N. 85° E. from Kuchinotsu lighthouse, and a subsequent search revealed a shoal about a mile in extent with as little as 9 ft. over rocky bottom.

Yu sima is 315 ft. high, with foul rocky ground extending nearly a mile southward from it. Vessels should always pass northward of it.

Misumi no seto, 5½ miles E. ½ N. from Yu sima, leads from Simabara Gulf into the Yatsushiro Sea. Including its southern part, the *Zozo no seto*, it is 4 miles in length, with not less than 5½ fathoms at low water in the narrow winding channel, but the tidal streams run from 4 to 5 knots an hour in it; it is best to pass through at slack water. The northern entrance, westward of the islet in it, is less than a cable wide, but within it widens to 4 cables, and there is secure anchorage in 6 to 12 fathoms, sand and shells, off the town of *Misumi*, to which the railway is extended. Coal is shipped here from the Miike mines. It is high water here, on full and change, at 9h. 25m.; springs rise 18 feet.

Light.—On the West side of the entrance is a white wooden turret, showing a *fixed bright* light, elevated 129 ft., and visible 6 miles northward between N. 73° W. and N. 74° E.

Yanagino seto, 5 miles south-westward of Misumi no seto, is a more intricate channel into the Yatsushiro Sea.

Simabara is fronted by a wide bank on which are numerous rocks. It is connected with the telegraph system by a cable across the gulf.

Chikugo or *Tsikugo gawa* has only 3 ft. in the entrance at low tide; at *Okaisa* is a dry dock, 250 ft. long, with an entrance 40 ft. wide, having 11 ft. on the sill at high water springs. Westward of it, in the northern angle of the gulf, is *Suminoye*, in the approach to which lies a *black* beacon *buoy*, in a depth of about 7 feet.

OMUTA or Miike Harbour.—About 15 miles N. by E. ¼ E. from Simabara a dock is approaching completion, near *Yotsuyama*, south-westward of Omuta, to accommodate vessels up to 8,000 tons, with wharves and all necessary appliances for the shipment of the gas and steam coal and coke from the adjacent mines, which now produce upwards of 4,500 tons per day. The harbour will have an area of 250 acres, approached by a channel a mile long and a cable wide with a depth of 18 ft. at low tide. The dock, with an area of 23 acres, will have a depth of 26 ft. at high neap tides. A *fixed bright light* is shown in the vicinity.

Kumamoto is a town of about 60,000 inhabitants, 4 miles inland, on the opposite side of the gulf to Simabara. The railway passes near it. The shore here is fronted by a wide shallow bank.

AMAKUSA ISLAND is about 30 miles in extent N.E. and S.W. Anthracite coal is worked in its western part and on the N.E. coast, the principal mine being at *Shiki*.

Pages 907-908.—**Tomioka Harbour** is only suitable for small vessels. The entrance is nearly 2 cables wide, and the depths are 3 to 4¾ fathoms.

In 1896, the steamer *Queen Olga*, drawing 23 ft., was reported to have struck bottom rather more than a mile West of Shiki saki, the peninsula forming Tomioka Harbour.

Page 908.—**Sakitsu** or *Sagitsu ura*.—*Koga se*, 2 miles north-westward of the entrance, are about 76 ft. high, with deep water around; at 1¼ mile northward of them are *Oga se*, 95 ft. high.

Southward of Koto no ura are several off-lying islets and numerous rocks, which should not be closely approached. *Kata sima*, the southernmost, is 210 ft. high; bearing eastward of S.E. by E. it will lead clear of the outer or western rocks.

Gesu or *Kasu sima*, adjoining the southern extreme of Amakusa, is about 400 ft. high; its southern side is indented by a deep wide bay. Gesu has off-lying islets and rocks around it, the southernmost being *Gan se*, 30 ft. high, lying a mile southward of the S.W. point.

Ushibuka Harbour, on the North side of Gesu sima, affords anchorage off the town, in 13 to 15 fathoms, at about 7 cables W. by N. ½ N. from *Idoi se*, some off-lying rocks 8 ft. high. Vessels can also anchor in 13 fathoms, 8 cables N.N.W. of Idoi se. Anthracite coal is mined in the vicinity. It is high water, on full and change, at 8h. 20m.; springs rise 8 feet.

To sima Light.—To sima, 2¼ miles eastward of Ushibuka, rises in a conical hill 470 ft. high. On its N.E. extreme stands a white stone turret, showing a *fixed bright* light, elevated 152 ft., and visible 8 miles between N. 14° W. eastward and S. 36° W.

NAGASAKI BANA Lighthouse, on the S.W. extreme of Naga sima, is a white iron tower 41 ft. high, showing a *flashing bright* light every 10 *seconds*, elevated 81 ft., and visible 15 miles seaward between S. 30° E. and N. 14° W. Lat. 32° 7′ 30″ N., long. 130° 6′ 10″ E.

YATSUSHIRO or Otentosama Sea offers but few difficulties to navigation, with the aid of the chart, there being deep water between the islands in its S.W. part, and the fairway having only a few known dangers.

Naga sima is 8½ miles long, and rises to an elevation of 1,290 ft. in its centre. *Naga sima Strait*, between its N.W. end and To sima, is less than a mile in width, and the tidal streams run 4 to 5 knots an hour, so that slack water is the best time to use it.

Kamimate jima Light.—At 5¼ miles N.E. ¼ E. from To sima lighthouse, and about half a mile S.E. of Ubu sima, is an islet on which stands a white stone turret, showing an unattended *fixed* light, elevated 60 ft., and visible 6 miles; *red* between N. 50° E. and N. 56° E., over *Ose ne* a 2½-fathoms reef nearly 2 miles to N.E. ⅔ E., and *bright* elsewhere.

The best channel into Yatsushiro Sea is *Gannoshiri seto*, N.E. of Shishi sima.

Kuro seto, the passage S.E. of Naga sima, is less than 2 cables wide in some parts, but is deep in mid-channel. The tidal streams run nearly 5 knots an hour in it; it is high water, on full and change, at 7h. 47m.; springs rise 10¾ ft., neaps 7 feet.

Yatsushiro, on the eastern side of the head of the gulf, is a considerable town, connected with Moji by railway, which is being extended towards the town of Kagosima. Flats dry for 2 miles off it at low water, and the anchorage off it, in 4 to 6 fathoms, is fronted by the shoal bank extending from the head of the gulf to Tsuki sima, there being a least depth of 3½ fathoms in the approach.

Zozo no seto, the strait leading into Simabara Gulf, is descibed in the Addenda for page 907. On the North side of the entrance stands a white tower 22 ft. high, showing a *fixed light*, elevated 101 ft., and visible 8 miles; *bright* southward from S. 59° E. to N. 60° W., and *red* thence to N. 22° W. An unattended light is also shown on *Tera sima*, 1¼ mile within the entrance.

Page 909.—**Oho se** is a dangerous sunken rocky pinnacle, with deep water around, lying 3¼ miles S.W. ⅓ W. from Futa sima.

Page 910.—**The Coast** from Shemmi hana trends 6 miles eastward to Akaeshe hana, and thence 5½ miles south-eastward to Okaimon daki.

KOSHIKI ISLANDS.—A telegraph cable is laid from Arakawa, on the Kiusiu coast, to Yeishi on Kami Koshiki, and thence to Nagahama on Shimo Koshiki.

Page 911.—**TSURIKAKE SAKI Lighthouse**, on the southern extreme of Shimo no Koshiki, is a white brick tower 36 ft. high, in lat. 31° 37′ 30″ N., long. 129° 40′ E.; it shows a *double-flashing bright* light every *minute*, elevated 462 ft., and visible 26 miles seaward from S. 85° E. to N. 62° W.

Kami no Koshiki is hilly, rising to 1,402 feet. In the northernmost of the bays, north-westward (not eastward) of its South point, is the chief village of *Naka*.

Page 912.—**Naka no se** or *Pioneer Rocks*, lie 2¾ miles S.E. ⅔ E. from Kuro Kami, and a 4¼-fathoms rock lies 6 cables S.W. ½ S. from them.

Taka sima lie 11 miles S. ¾ E. from Tsurikake saki lighthouse.

Udsi sima, or *Uji Gunto*, lie 15 miles W.S.W. of Tsukara se. *Mukai* or *Udsi sima* is 1,066 ft. high, and the *Haycock* 314 feet.

Page 913.—*Sami sima* is 210 ft. high.

Page 915.—**Liancourt Rocks** were passed by the U.S.S. *New York*, in 1902, whose officers placed them in lat. 37° 9½′ N., long. 131° 55′ E.

MATSU SIMA.—At 7 cables off the N.E. coast is the large *Boussole Rock*, southward of which there is said to be anchorage. In 1888, the captain of the steamer *Wismar* reported a dangerous rock, with 2 to 3 ft. water over it, to lie at 2¾ miles N.E. by N. ¾ N. from Boussole Rock.

Waywoda Rock was carefully but unsuccessfully searched for by the French cruiser *Primauguet*, in 1886, a depth of 76 fathoms being found in its reported position. In 1886, also, a squadron of eight British war-vessels passed here, without any signs of such a rock being seen. In 1888, Capt. Wicks, U.S. whaler *Coral*, reported he several times passed close to two rocks, 8 to 12 ft. high and about 500 yards apart, in lat. 42° 30′ N., long. 137° 5′ E.; consequent upon this, a most exhaustive search was made in this region by five vessels of the British China squadron, but no trace of any rocks could be found. In July, 1891, a rock 20 ft. high was again reported to have been seen from the U.S. whalers *Josephine* and *Coral*, in about lat. 42° 34′ N., longitude 137° 17′ E. These reports may possibly have arisen from floating wreckage.

TSU SIMA proved to be of considerable strategical importance to Japan in the recent war with Russia, the former having established a naval station at *Takeshika*, in the S.E. inlet of the sound. The northern part of the island rises to an elevation of 1,635 feet.

KO SAKI Lighthouse, on the southern extreme of Tsu sima, is a white wooden tower 22 ft. high, showing a *fixed* light, elevated 192 ft., and visible 15 miles; *bright* southward between S. 85° E. and West, and *red* over the rocks off Tsutsu saki, between West and N. 63° W. Lat. 34° 5′ N., long. 129° 12′ 45″ E.

The West coast of Tsu sima trends 14 miles N. by E. from Tsutsu saki to the entrance of Tsu sima Sound, northward of which the coast is indented by several inlets and bays, in which secure anchorage might be found. A rocky reef runs parallel with the North end of the island at 1 mile off, the largest rock on which is named Mitsu sima.

Mitsu sima Lighthouse is a black wooden tower 18 ft. high, in lat. 34° 43′ 30″ N., long. 129° 27′ E.; it shows a *fixed bright* light, elevated 52 ft., and visible 8 miles seaward between S. 55° W. and S. 42° E.

TSU SIMA SOUND, or Tatemura, has some sunken dangers marked by *buoys* within the entrance. Being a naval port, no vessel is allowed to enter the sound without the permission of the authorities, and they must wait outside till it be obtained. There is a signal station on Imo saki or Finger Point, 2½ miles within the entrance. There is telegraphic communication with Japan and Korea. A pontoon dock, 250 ft. long, can raise vessels weighing up to 1,600 tons.

Page 916.—The East coast of Tsu sima is indented by numerous bays and inlets, in which anchorage may be found.

Tides.—The flood stream sets southward around Tsu sima, and the ebb northward, at 1 to 2 knots an hour, causing rips off the projecting points. In the offing there is a permanent north-easterly set.

1908.

Pages 918-922.—**FORMATION of CORAL ISLANDS and REEFS.**—Darwin's theory appears to have received confirmation by the results of deep borings near Honolulu and at Funafuti Island (Ellice group). In the American Journal of Science, 1889, and in his later well illustrated book, "Corals and Coral Islands," Prof. J. D. Dana describes those near Honolulu, when coral rock was found to a depth of 1,178 ft., followed by lava, at a well at the foot of Diamond Head. Again, in 1899, Prof. E. David, of Sydney, superintended a boring to a depth of 1,114 ft., at Funafuti, when

only rock of coral origin was met with. As these depths are far below that at which living coral can exist, these borings appear to confirm the theory of subsidence.

Other observers, however, have strongly contested Darwin's theory, and from scientific examinations of coral islands and reefs in all parts of the world it seems that it cannot apply in all cases.

Dr. John Murray (in the Proc. of the Royal Society of Edinburgh, vol. x., pp. 505-518) contends that atoll and barrier reefs have been formed upon a volcanic or other basis by the deposition of organic and other sediments upon which corals have built upwards, the growth being more vigorous on the outer margin, lagoons being formed by currents and the action of carbonic acid in the sea-water. This theory of upward growth is also supported by Mr. H. B. Guppy (in vol. xiii., pp. 857-904, of the same Society's Proceedings) from his observations on elevated coral rocks in the Solomon Islands; and by Prof. A. Agassiz (in the American Journal of Science, 1898) from similar researches in the Fiji Islands. In these cases, however, the coral deposits may have been formed in the manner Mr. Darwin decribes, and afterwards have been raised far above the sea by volcanic action.

The whole question is very ably discussed by Dr. R. Langenbeck, in his work "Die Theorien über die Entstehung der Koralleninseln und Korallenriffe," in which he sums up his conclusions as follows:—"Some of the facts, upon which objections to Darwin's and Dana's theory were based, were not correct, and others can easily be brought into accordance with that theory, which explains the peculiarities in the structure of atolls and barrier reefs in a quite satisfactory way; while Murray's and Guppy's theories are not in a position to do so, and are contradicted by a series of important facts."

The DATE LINE in the PACIFIC OCEAN.—Some confusion arises in the dates used in the islands lying near the meridian of 180°, certain islands lying West of that line using the American date, while others East of it use the Asiatic date, the latter being one day later. Thus, a certain day may be Saturday, the first day of the month, on the American side of 180°, and this will be Sunday, the second day, on the Asiatic side. To allow for this, shipmasters westward bound omit from their log the day immediately succeeding that on which the meridian of 180° is crossed; when eastward bound, the date is repeated. In making meteorological and other observations at Greenwich mean noon, the time used would naturally be that of the chronometer, and not local time.

The *American* date is used in Alaska, St. Lawrence Island, all the Aleutian Islands, Morrell Island, Phœnix Islands, and Samoa Islands, while the *Asiatic* date (one day later) is in use in Siberia, Kamchatka, Copper and Commander Islands, the Marshall, Gilbert, Ellice, Fiji, and Tonga groups, New Zealand and Chatham Islands.

Page 923.—**MALPELO ISLAND** was examined by U.S. officers in 1891, and found to be a little over a mile in extent N.E. and S.W., and one-third of a mile wide, with some islets and rocks northward and southward of it, but not over half a mile distant. Its summit rises to an elevation of 846 ft., in lat. 3° 59′ 7″ N., long. 81° 34′ 27″ W., and is visible from a distance of 30 or 40 miles. No anchorage was found.

Pages 923-924.—**RIVADENEYRA SHOAL** was unsuccessfully searched for by the U.S.S. *Mohican*, in 1885.

Page 924.—**COCOS ISLAND** has come into prominence of recent years, owing to the numerous expeditions made thither in search of vast buried treasure, said to have been hidden there in 1820 and 1821 by the pirate Benita and others, and in 1835 by the crew of the barquentine *Mary Dier*, small portions of which were subsequently recovered. So circumstantial were these reports, that a search (unsuccessful) was actually made by the crews of H.M.S. *Impérieuse* and other vessels of the North Pacific squadron, in 1897.

Cocos Island belongs to Costa Rica, and is about 4 miles in extent N.E. and S.W., by $2\frac{3}{4}$ miles in greatest width, rising to an elevation of 2,788 ft. in its western part, according to the British Admiralty chart. In 1895, it was partly surveyed by Captain R. M. Passmore, retired R.N., under the direction of the government of Costa Rica; he reported the chart as quite inaccurate in the outline, and that the summit is 2,250 ft. high. The coast is bold, steep, and rocky, with several islets and numerous rocks around it, the outermost being an isolated rock dry at low water, about $1\frac{1}{2}$ mile to the W.S.W. of Dampier Head, the southern extreme of the island. The interior has numerous fertile valleys, but there is very little level ground. There is a small Costa Rican settlement at Wafer Bay.

Page 925.—The anchorage in *Chatham Bay* is said to be bad, and the surf makes landing difficult, especially at high water; good drinking water and fire-wood are plentiful here.

Wafer Bay is said to be inferior to Chatham Bay as an anchorage, and a heavy surf usually beats on the rocky shore. In October, 1897, H.M.S. *Impérieuse* found good anchorage in 29 fathoms, sand, with the small islet in the centre of the bay in line with an iron-roofed dwelling, bearing S. 60° E. (a good mark for approaching), and the West extreme of Cascara Islet N. 15° E.; the water shoalens rapidly within this position. Spring tides rise about 10 feet.

Tide-rip (?).—On August 9, 1893, Capt. H. B. Conby, British ship *Garfield*, reported that at about 5 a.m., in lat. 2° 44′ N., long. 104° 54′ W., wind very light, he sailed through a belt of disturbed water about 100 yards wide, extending E. by N. and W. by S. as far as the eye could see; the water was breaking and frothy, making a strange confused noise, and numerous turtle and flying-fish were afterwards seen. The temperature of the water was 75° F., increasing as he steered N.W. to 79° at noon. This would be on about the boundary between the South Equatorial Current and the Equatorial Counter-current.

Oceana Bank.—On June 3, 1891, at 6 a.m., Capt. J. Page, British ship *Oceana*, noticed discoloured water, and on sounding an hour afterwards, in lat. 8° 24′ N., long. 115° 25′ W., found 63 fathoms, hard rock; an hour later, steering about 2 miles south-eastward, he got 101 fathoms, and at 9 a.m. no bottom at 120 fathoms, the water afterwards resuming its natural colour. In 1902, Capt. Asmussen, U.S. schooner *Samar*, observed discoloured water in the same position, but took no soundings; there were numerous birds about.

In 1893, Capt. H. Henderson, U.S. schooner *Golden Shore*, reported that he had twice sailed over the position of a reef shown on the Equator in the U.S. chart, in long. 150° W., and saw no indication of a reef hereabout.

Honolulu Breakers.—On April 28, 1901, Capt P. M. Stokkebye, schooner *Honolulu*, saw breakers (three-quarters of a mile apart) about 2 miles distant, in lat. 7° 33′ N., long. 153° 42′ W., weather clear and sea smooth.

Page 926.—**WALKER ISLANDS** have been removed from the chart, a depth of 2,925 fathoms having been found hereabout.

JARVIS ISLAND was annexed by Great Britain in 1889, and leased to a New Zealand firm for growing cocoanuts, but we have no recent account of it. It is of rectangular form, $1\frac{3}{4}$ mile in extent North and South, by $1\frac{1}{4}$ mile in width. The officers of H.M.S. *Cormorant*, 1889, gave its position as lat. 0° 22′ 30″ S., long. 160° 0′ W. A bank, on which 5 fathoms was found, extends about 1 mile off the N.E. point, and another bank extends off the S.W. point, but there is no anchorage; boats can land by a break in the reef on the N.W. side, near the settlement.

In 1891, the U.S.S. *Iroquois* passed near the reported position of *Brooke Island*, but nothing was seen of it.

Pages 926-928.—**CHRISTMAS ISLAND** was annexed by Great Britain in 1888, and is now occupied by cocoanut plantations; the lagoon abounds with pearl-shell, which has been exported in considerable quantities. The seas abound with fish and sharks, the latter being caught for their fins and tails. In 1901, there were twelve people living on the island, who are relieved once a year by a steamer, which takes away the copra and other products. Fresh water is found by digging shallow wells.

Christmas Island is one of the largest lagoon islands of the Pacific, being upwards of 100 miles in circuit. The chart can only be considered as a sketch; in 1906, the coast-line was reported as inaccurately delineated. From the S.E. point to the S.W. (not N.W.) point the coast runs about N.W. by W. $\frac{3}{4}$ W., 22 miles.

A dark red conical iron *beacon* surmounted by a pole, rising about 65 ft. above high water, stands about a mile westward of the S.E. point. Another *beacon* stands on the low East point. A cairn has been erected on the N.W. point, where the trading schooners find anchorage and good landing.

The settlement is on the N.W. side of the island, on the North side of the entrance to the lagoon. Northward of it are two *beacons*, which in line, bearing E. by N. $\frac{1}{2}$ N., lead to good anchorage, in 12 fathoms, quite out of the current (which here runs strong to the westward), with the North extreme of Cook Islet S. by E. $\frac{1}{2}$ E., and the flag-staff at the settlement East.

Easterly winds prevail at Christmas Island, with occasional northerly or southerly squalls. The surrounding currents are strong and uncertain; they generally set westward and north-westward, especially at full and change, but they have also been observed to set in a reverse direction. Many wrecks have occurred upon the eastern coast.

Pages 928-930.—**FANNING ISLAND** was formally annexed by Great Britain in 1888, and was surveyed by the officers of H.M.S. *Penguin* in 1897. It is under the administration of the governor of Fiji, and has come into prominence as a station for the submarine cable connecting Vancouver Island and Australia, completed in 1902, the cables being landed at Whaler Anchorage. The cocoanut plantations yield large quantities of copra, and pearl-shell is found in the lagoon. Phosphate of lime is no longer shipped here, the grade having become too poor. The soil is too poor for much cultivation, and most of the provisions for the settlers and cable staff have to be imported, though cattle, pigs, and poultry are kept. Rain-water is stored in tanks, and good fresh water is also obtained from wells. In 1901, the settlement on the southern side of English Harbour contained 47 inhabitants, Gilbert Islanders, under a Scotch trader. In 1907, the owners of the land sold their rights to M. Rougier, a French missionary, for £25,000; the inhabitants then numbered about 150.

The only safe anchorage is around the North and N.W. sides of the island, and at English Harbour, in other parts the reef being too steep-to.

Easterly winds prevail at Fanning Island; but during January, February, and March, strong northerly and north-westerly winds occur with much rain, sometimes rendering anchorage unsafe.

English Harbour entrance is less than half a cable wide, with depths of 4½ to 7 fathoms, between the reefs on either side, but the tidal streams here run 3½ to 5 knots an hour, rendering it unsafe except near slack water. The prevailing winds render it unsuitable for square-rigged vessels. A pilot will come off when a vessel is seen approaching.

Large vessels must lie off the settlement, in 4 to 5½ fathoms, in the strength of the tidal streams, but vessels which can cross a bar of 12 to 15 ft., will find good anchorage in depths up to 8 fathoms farther in. There is an iron pier at the settlement, and vessels drawing up to 18 ft. can lie close to it. In 1897 and 1902, there were from 150 to 350 tons of coal in store, but probably only for the use of the cable-steamer. No other supplies can be depended on, but fish can easily be caught.

It is high water, on full and change, at 6h. 15m.; springs rise 2 feet.

Whaler or Whaleman Anchorage is 3½ miles north-westward of English Harbour, about 2½ cables off shore, in 10 to 20 fathoms, and is useful to vessels waiting for the tide to enter English Harbour. Landing is easy, a boat channel having been blasted through the reefs. In 1905 there was a mooring-buoy in 12 fathoms, about 3½ cables north-westward of the landing-pier, and a small buoy marked the entrance of the boat channel. Near the pier is the telegraph cable station. Two *beacons* in line, bearing E. by S. ⅞ S., will lead to the mooring-buoy, and vessels must not anchor southward of this line, to avoid the telegraph cables.

Page 930.—**WASHINGTON ISLAND** was annexed by Great Britain in 1889, and according to the officers of H.M.S. *Penguin*, in 1897, the observation spot near the village at the western end is in lat. 4° 43′ N., long. 160° 25′ 30″ W. In 1901, there were 147 inhabitants, occupied in the preparation of copra; H.M.S. *Icarus* anchored about 6 cables off the western shore, but found it a very uncomfortable berth, and other vessels have had the same experience anchoring farther off. A better boat landing has been made eastward of the village. Being situated near the southern boundary of the Equatorial Counter-current, the currents around this island are probably variable.

Pages 930-931.—**PALMYRA ISLAND** was annexed in 1889, and surveyed by the officers of H.M.S. *Penguin* in 1897, who found a small islet near the S.W. end of *Penguin Spit*, the southern reef, to be in lat. 5° 52′ 18″ N., long. 162° 5′ 55″ W. There were then no permanent inhabitants.

Palmyra Island is an atoll about 5 miles in extent East and West, by 1½ mile in greatest breadth, enclosing three deep lagoons having no visible connection with the sea, except at the western end. Reefs, drying in patches, extend 1¼ mile off the eastern end, and a shoal, occasionally breaking, extends 1½ mile farther eastward, very steep-to on either side. The western end of the atoll is fronted by a vast assemblage of coral heads for 1 mile off, and outside this a wide bank of 6 to 15 fathoms extends 2½ miles farther westward, affording good anchorage, but its edges are very steep.

Landing is difficult at low water; the best was found on the northern side of Penguin Spit. It is high water, on full and change, at 5h. 5m.; springs rise 3 feet. Strong and variable currents may be expected hereabout.

Page 932.—**KINGMAN REEF** was surveyed in 1897 by the officers of H.M.S. *Penguin*, who observed its S.E. extreme to be in lat. 6° 23′ N., long. 162° 18′ 20″ W. It lies 33 miles N. W. ½ N. from Palmyra Island, and is an atoll of triangular shape apex northward, 9½ miles in extent at its base East and West within the 100-fathoms line, and 5 miles North and South. It dries at low water on its N.E., East, and S.E. edges, and the remainder is a ridge with 4 to 10 fathoms over it, and very steep-to. In this region the Equatorial Counter-current sets eastward, 30 to 42 miles a day.

The *Penguin* made a thorough but unsuccessful search for *Caldew* and *Maria Reefs*, and they are considered to be identical with Kingman Reef.

On February 22, 1897, Capt. Brabender, barque *Selkirkshire*, passed near a dark green patch of water (but took no soundings) north-eastward of Kingman Reef, in about lat. 6° 40′ N., long. 161° 52′ W., and thought it to be a reef.

Maria or *Crane Shoal*.—See above.

Diana Shoal, reported in 1852, in lat. 8° 40′ N., long. 157° 20′ W., has not since been seen, and was searched for in vain by H.M.S. *Hecate*, in 1863. In 1891, the U.S.S. *Iroquois* failed to find it; and in 1897, H.M.S. *Penguin* spent five days searching for it, and found depths of nearly 3,000 fathoms hereabout. It has been removed from the chart.

Bray Rock.—In 1898, Capt. Bray, U.S. Mission steamer *Morning Star*, reported having passed a rugged coral rock about 50 yards long, and 6 to 10 ft. high, in lat. 7° 32′ N., long. 173° 13′ W. In 1900, the captain of the steamer *Warrimoo* reported that he twice passed near this position and kept a good look-out, but nothing was seen of such a rock.

Pages 932-934.—**BAKER ISLAND** belongs to Great Britain, and its centre is now considered to be in long. 176° 31′ 11″ W. The guano has all been removed, and the settlement abandoned. There is no anchorage. The tidal streams usually set N.E. and S.W., but occasionally N.W. and S.E., running at times 1½ to 2 knots an hour.

Pages 934-935.—**HOWLAND ISLAND** belongs to Great Britain, and its centre is now considered to be in long. 176° 41′ 41″ W. The guano has all been removed, and the settlement abandoned. In 1890, the captain of the barque *Notero* reported he had struck on a rocky ledge extending a mile westward from the N.W. point; its existence was confirmed later by Capt. Tribe, schooner *Ryno*.

Pages 935-938.—**The GILBERT ARCHIPELAGO** has not yet been accurately surveyed, and the relative positions of the islands are still in doubt, so that the chart must be used with caution. It was placed under British "protection" in 1892, together with Paanopa or Banaba, and government is carried on by a small European staff (under the High Commissioner for the Western Pacific), assisted by a force of native police, the head-quarters being at Betio or Bititu, Tarawa Island. Nearly every island of the group is under an independent chief. The natives, now estimated to number about 20,000, are quite friendly and under control, and said to be increasing in numbers; there are four different missions working among them, and each island has one or more stations. Few supplies can be obtained from the natives; fresh water is scarce, and usually brackish, the milk of the cocoa-nut being used for quenching thirst. The same language is used throughout the group.

They are but of small commercial importance, the principal exports being copra and shark-fins, with small quantities of bêche de mer. In 1900, the last year for which statistics have been published, the copra exported from the Gilbert and Ellice groups (2,267 tons) was valued at £21,164, and shark-fins £417. Besides the trading schooners, the islands are visited by a steamer from Sydney, N.S.W., about every three months. Vessels are not allowed to trade without a permit.

An interesting account of these islands is given by Mr. C. M. Woodford, in the "Geographical Journal," October, 1895, pages 325-350. We are also much indebted to Mr. H. J. Moors, of Apia, for some original and valuable information concerning them. Other particulars have been gained from the German Seewartes "Annalen der Hydrographie," vols. xviii., xix., xxix., and xxxi.

Deep-sea soundings taken among the group show that the islands are isolated peaks rising from depths of 1,500 to upwards of 2,000 fathoms. Of the sixteen islands, eleven are of atoll formation, rarely rising more than 12 ft. above the sea, and clothed with

a dense growth of cocoa-nut palms and other vegetation. The reefs and lagoons abound with fish.

Pages 938-939.—**Winds, &c.**—In the Annalen der Hydrographie, 1903, pages 348-354 and 388-395, is an article by Herr M. Prager on the meteorology of the Gilbert Islands, founded on a careful register by Capt. O. Kessler, of the schooner *Neptun*, kept during a period lasting from the beginning of the year 1900 to July, 1902.

According to these observations, between the parallels of 4° and 2° N., north-easterly winds prevail from December to May, and E.S.E. winds from June to November. Westerly winds were rarely met with, except in July, August, and December.

Between 2° N. and the Equator, N.E. winds prevailed in February and March, and winds from East and E.S.E. during the remainder of the year. Westerly winds were mostly met with in April, November, and December.

Between the Equator and 2° S., N.E. winds prevail from December to March, and are also frequently met with during the rest of the year. From May to October, East and E.S.E. winds prevail. Westerly winds may occur in December and March, and less frequently in January, April, and May.

The strongest winds were experienced in December, when a force up to 9 of the Beaufort Scale was met with between 4° and 2° N. Winds with a force up to 7 were experienced in July and August, between the Equator and 2° S. During the remainder of the year, the greatest force did not exceed 5 or 6 over the whole area of the islands.

Most rain falls in the months from December to August, and August, July, February, and January are the wettest. October is the driest month. Cyclones do not occur so near the Equator.

Mr. Moors says that Nanouti, and the islands southward of it, are subject to severe droughts; similar droughts also occur in the islands to the northward, but they are not nearly so frequent. These droughts affect the physique of the people, those on the southern islands being stunted and not so well developed as those to the North.

Capt. G. Ewart, schooner *Tarawa*, spent 2 year strading among the Line Islands, 1892-1894; and, in the Gilbert Islands, observed the prevailing wind to be S.E., blowing strongest from June to September; in October and November, there are light S.E. winds and calms. In December and January, westerly winds occasionally blow with severe squalls.

Page 939.—**Currents.**—As the Gilbert Islands lie near the boundary between the Equatorial Current and Counter-current, the surface currents are very irregular and uncertain among them, and are much influenced by the prevailing winds. In this region, however, the prevailing set is westerly, running strongly in the southern part of the group, and in the channels between Maiana, Tarawa, and Apaiang; northward of Maraki it is weaker. Mr. Woodford mentions that to reach Apamama from Kuria, a distance of only 15 miles, the vessel had to go North to almost 5° N. to reach the easterly current, it being utterly impossible to make way against the westerly current with the S.E. breeze then blowing, and was 9 days making the voyage.

Capt. Ewart observed the current to set West, as much as 90 miles in 24 hours, from July to March. During strong westerly winds in December and January, it has been known to run eastward, 50 to 100 miles in 24 hours. Between Apaiang and Tarawa the current frequently runs 5 to 6 knots an hour, but between the other islands usually from $1\frac{1}{2}$ to $2\frac{1}{2}$ knots an hour.

In July, 1883, in long. 175° E. on the Equator, the current was observed to run *eastward* 2 or 3 knots an hour, for 14 or 15 days, with a fresh *easterly* wind blowing.

Directions.—On account of the prevailing strong westerly current, sailing and other vessels bound to the Gilbert Islands should get on their parallel well to the eastward of them to avoid running past them; as in this case much time will be wasted in getting back, and the vessel may have to steer northward or southward to lat. 5° N. or 6° S., to reach the easterly currents, so as to get eastward of them again (*see above*). From Arorai, it is always possible to reach the other islands of the group with the prevailing easterly winds. As the islands are so low, and the currents so irregular, great difficulty may be found in making them.

The reefs surrounding the islands are steep-to, and in most of them the lagoon affords sheltered anchorage, under the guidance of a native pilot, who will come off on a flag being hoisted at the fore. Vessels visiting these islands should be provided with a surf-boat.

Pages 939-940.—**ARORAI** contained 1,050 inhabitants in 1901, from whom pigs, fowls, and fish could be obtained. Small vessels could anchor off its western side in 18 fathoms, close to the reef, with the stone church bearing N.E., but only in very fine weather. The South point is now charted in long. 176° 54′ 30″ E., but the captain of the steamer *Warrimoo* reports that it lies $3\frac{1}{2}$ miles farther West.

Page 940.—**NUKUNAU**.—Mr. Moors says there are several fairly good anchorages, in about 16 fathoms; one is about half a mile N.W. of the South end; another near the centre; and another near the North end. The natives will come off, and point them out. Capt. Credner, of the German gun-boat *Wolf*, says the best anchorage is opposite a large village, about 3 miles from the N.W. point, but only safe with northerly and easterly winds. Near the village is a conspicuous white wall around the prison. The S.E. point of Nukunau is now charted in long. 176° 31′ E.; in 1901, the officers of the German war-vessel *Cormoran* observed it to be in about lat. 1° 29′ S., long. 176° 36′ E.

Pages 940-941.—**PERU** is said to be inaccurately delineated on the chart, and to lie 6 to 12 miles eastward of its charted position. In 1901, the population numbered 2,300, and iron-wood of good quality could be had. Some of the fish here are poisonous. Capt. Credner says there are several anchorages along the western coast, and that the anchorage mentioned on page 941 is not good, owing to rocky patches. There is said to be better anchorage off the village 1½ mile from the South point, where there is a church and a trading station; here H.M.S. *Pylades* anchored in 15½ fathoms, about 50 yards from the edge of the reef. Here is the best landing, the South side of the boat channel being marked by stone beacons bearing a staff.

Page 941.—**ONOATOA** had about 1,200 inhabitants in 1886. Capt. Kessler, schooner *Neptun*, says it lies about 7 miles N.N.E. of its charted position, and in 1901 the officers of H.M.S. *Pylades* reported it to lie 5 miles North. Mr. Moors says "it is best to make this island from the North, and keep westward round the reef on which stands *Teumah Islet* (which had a trader's house on it). Round this islet, and stand S.S.E. into a deep bay in the reef, and good anchorage will be found about a mile from the islet in 7 fathoms, well off the reef. This is the best outside anchorage in the Gilbert group, being well protected from all but westerly winds."

TAMANA is stated to lie about 3 miles E.N.E. of its charted position; the captain of the missionary steamer *John Williams*, 1904, says it lies 10 miles eastward. Mr. Moors says there is no anchorage off the village, though small vessels have laid here in very fine weather with kedge anchors placed on the reef; the only anchorage is near the N.W. end of the island, just northward of a point of heavy breakers, dropping anchor in about 12 fathoms, and there will be plenty of room to swing. Landing is only possible at high water. Pigs, fowls, and firewood may be had from the village, but no fresh water.

Pages 941-943.—**TAPUTEOUEA** has 6,000 or 7,000 inhabitants, and there are several mission and trading stations. Supplies are scarce and no fresh water can be had. The island is said to be incorrectly charted, and to be about 40 miles in extent, the reef at the N.W. end extending much farther seaward. Capt. Kessler says it lies 10 miles southward, and farther eastward than shown on the chart. He also states that *Nautilus Reef* is the southern extreme of a dangerous reef extending south-westward from the southern end of the island, not marked by breakers, and not even a schooner could cross it. It is high water, on full and change, at 4h. 50m.; springs rise 6½ ft., neaps 18 inches.

Anchorage may be found almost anywhere along the western side of Taputeouea, but *Peacock Anchorage* is the best, in 6 to 15 fathoms, keeping a good look-out for coral heads in approaching it. Landing is always easy near the church north-westward of Utiroa. With care small vessels, drawing up to 8 or 10 ft., can pass inside the reef, and lie within a mile of the shore; large vessels lie about 4 miles off. H.M.S. *Pylades* anchored in 8 fathoms, with the N.W. extreme of the land bearing N. 27° W., and a sand-patch S. 60° E.

There is said to be a good anchorage off the South end of Taputeouea, near a wooded islet; also in 15 fathoms, 2 miles farther westward, at about half a mile off a passage into the lagoon. The entrance of this passage is about 3 miles from the land; it is about 1½ cable wide, and has 3½ fathoms least water. The lagoon is navigable for about 5 miles north-westward, but only boats could pass through to Peacock Anchorage.

Capt. A. C. Walkup, missionary schooner *Hiram Bingham*, says there is a narrow 2-fathoms passage through the reef at the N.W. end of Taputeouea, at 1½ mile S.E. from a sandbank.

Page 943.—The N.W. point is now charted in long. 174° 40′ E.

Caluna Rock.—In 1889, the schooner *Caluna* was reported to have struck on a rock, with 5 ft. water over it, about midway between Taputeouea and Nanouti, or in lat. 0° 58½′ S., long. 174° 33½′ E., its existence is doubtful, as the traders and natives know nothing of it.

Pages 943-944.—**NANOUTI** (locally called *Nonutch*) is about 23 miles in extent N.W. and S.E., and 10 miles in greatest width. In 1902, the population numbered about 3,000, and there were several mission and trading stations. According to a survey by the officers of H.M.S. *Archer*, 1902, the South point (on which stands a hospital) is in lat. 0° 49½′ S., long. 174° 28′ E.; the northern islet is now charted in 0° 33′ S., long. 174° 14½′ E. It is high water, on full and change, at 4h. 15m.; springs rise 6½ ft., neaps 5 feet. Off the western coast, outside the lagoon, the flood stream sets north-westward and the ebb south-eastward, running 1½ to 2½ knots an hour.

In approaching Nanouti, a thick clump of cocoanut palms on *Temotu*, the South extreme of the atoll, will appear like an island at a distance. On the North end of Temotu is a leper hospital, and about 4 miles northward of this is the white frame bell-tower of the mission at *Taboiaki*.

Vessels may find temporary anchorage in about 8 fathoms along the western reefs of the atoll, but the best place to anchor is in the lagoon. Mr. Moors says the most convenient anchorage is in 15 to 17 fathoms, in a bight of the reef, about 1½ mile north-westward of the N.W. end of Temotu. From here the mission station bears N. by E., and there is a boat channel into the lagoon.

A wide reef extends about 10 miles south-westward from the North end of Nanouti, and on it stands an isolated islet named *Numaton*; another wide reef, named *Autaken*, extends nearly 10 miles westward from the southern part of the atoll, and between these two reefs is the entrance to the lagoon. It is marked by a dry spit of sand, and is navigable with the aid of local knowledge; several beacons mark the channel through the lagoon, which has about 4 fathoms least water. A pilot will come off on signals being made. There is anchorage close to the land, in 6 fathoms.

In approaching the lagoon from the South, beware of the shallow *Autaken Spit*, which may be seen by the light colour of the water on it. If from the North, beware of a similar bank reaching off the western and southern parts of the northern reef.

Pages 944-945.—**ARANUKA** is now said to have less than 100 inhabitants; its South point is charted in lat. 0° 8′ N., long. 173° 37½′ E. There is anchorage on the bank off the western part of the reef, but exposed to a heavy swell. There is a boat passage into the lagoon, about the middle of the S.W. side of the atoll, off which there is anchorage in 10 to 15 fathoms. A native pilot will come off if signalled.

Page 945.—**KURIA** is said to be incorrectly delineated on the chart, and the reef off its N.W. end is reported to reach about 2 miles farther westward, with 6 to 10 fathoms along its western and southern edges. Kuria has now less than 50 inhabitants, and like Aranuka, is under the control of the chief of Apamama, who comes here occasionally. It is thickly wooded, and water, firewood, and coarse taro may be had. Mr. Moors says there is good anchorage all along the western side, the most convenient being in about 11 fathoms off the break near the centre, and near the boat passage through the reef. The South point is charted in lat. 0° 12′ N., long. 173° 24¾′ E.

Pages 945-946.—**APAMAMA**, the wealthiest of the Gilbert group, is about 13 miles in extent N.W. and S.E., and the lagoon is navigable by vessels of considerable size. In 1901, the inhabitants only numbered about 1,100, and there were no trading stations, the chief keeping all trade in his own hands. The S.W. side of the reef is steep-to.

The western passage into the lagoon, 4 miles south-westward of the North end of the atoll, is about one-third of a mile wide, with a least depth of 2½ fathoms at low water, and there is said to be little or no current in it. Vessels leaving usually go out by this passage, but a vessel wishing to enter might not be able to get a pilot here.

The southern passage, about 5 miles eastward of the western extreme of the atoll, will easily be known by *Entrance* or *Bike Island*, on which were two high flagstaffs; about a quarter of a mile northward of this island is a dry patch, which the officers of H.M.S. *Dart* observed to be in lat. 0° 20′ 54″ N., long. 173° 51′ 14″ E. Vessels must not attempt to enter without a pilot, as the tidal streams run strongly. There is good anchorage in the middle of the entrance, in 8 fathoms, 6 cables N.W. of the western end of Entrance Island. It is high water here, on full and change, at 3h. 30m.

When the lagoon is entered, vessels cross over to the large village of *Binoinano*, situated on the N.E. side of the atoll, the depths in the fairway varying from 4 to 15 fathoms.

Page 946.—**MAIANA** is an atoll of rectangular form, and contains about 1,700 inhabitants, with mission and trading stations. The western part of the reef is very dangerous, and is reported to extend several miles westward of its position on the

chart; several vessels have been wrecked here, the land not being visible from the deck. The South end of the atoll is charted in lat. 0° 49′ 30″ N., long. 173° 0′ 45″ E., and its North end in long. 173° 1′ 15″ E.

At 2 miles south-westward of the North end is a boat channel, marked by stone beacons, leading into the lagoon, but not navigable between half-tide and low water. About a mile off it there is anchorage in 15 to 17 fathoms, sand and coral, with the North extreme of the land bearing N.E.; or closer in, in 8 fathoms. Anchorage may also be had all along the N.W. side of the reef.

Mr. Moors says there is said to be a passage on the S.W. side of the reef, through which small vessels have passed into the lagoon; it is marked by a sandbank.

Pages 947-948.—**TARAWA** contains about 1,300 inhabitants, and has trading and mission stations. It is also important as being the seat of the British Resident of the Gilbert group, the station being on *Bititu Island*, at the S.W. point of the atoll. Fresh water, but no other supplies, may be had here. The sunken reef is said to extend farther West than shown on the chart, and has anchorage all along it, in 10 to 15 fathoms. The reef is also said to extend about 2 miles westward of Bititu.

In approaching Tarawa from the South, give the S.E. extremity a berth of at least 5 miles, as a strong current splits off this point, one branch continuing to flow westward and the other turning North.

The lagoon is safely navigable by vessels up to 13 feet, but a stranger must have a pilot. At low water, the reefs dry out for as much as 2 miles from the land, and the lagoon water is sometimes very thick. The passage usually taken into the lagoon is about 4 miles northward of Bititu, and by keeping a white beacon on Bikeman Island (near the centre of the lagoon) bearing E. ¾ S., a vessel will pass through in 4 fathoms least water. A 2½-fathoms shoal, lying in the entrance, is marked by a *barrel buoy*, lying nearly 3 miles N. ⅜ E. from the settlement flagstaff. On Bititu are two beacons, which in line bearing S. ½ E. lead to the anchorage off the settlement. A *buoy* marks a 9-ft. rock about one mile N. 19° E. from the flagstaff.

A reef is stated to extend 5 miles S.W. from the North point of Tarawa.

Page 948.—The North extremity of Tarawa is now charted in lat. 1° 38′ N., long. 172° 57½′ E., and the S.E. point in lat. 1° 21′ N., long. 173° 8½′ E.

Page 948.—**APAIANG** had about 2,350 inhabitants in 1901, the principal village being *Koinawa*, on the N.E. side of the atoll. There are mission and trading stations on it. The lagoon is navigable with the aid of local knowledge.

Bingham Passage should only be entered at slack tide or on the flood, as the ebb causes a dangerous rip, which renders the outer anchorage a bad one. In entering keep nearer the southern side, keeping a good look-out for two coral heads with only 3 and 6 ft. over them. Eastward of Bingham Passage are two boat channels, with about 6 ft. water. Vessels can anchor in 5 fathoms, about three-quarters of a mile off Koinawa.

The *N.W. Passage*, 3½ miles north-westward of Bingham Passage, has 2½ fathoms least water between the numerous coral heads, and is about a quarter of a mile in width.

At the western extreme of the atoll is *Nanikirata Island*, north-westward of which is the anchorage of *Litiu*, reported fit for vessels of any size.

The northern point of Apaiang is now charted in lat. 1° 57′ N., long. 172° 53′ E.; and the S.E. point in lat. 1° 42½′ N., long. 173° 1′ E.

Pages 948-949.—**MARAKI** is one of the most perfect examples of a coral atoll, the land being almost unbroken, and its appearance was compared by Dr. Dana to a garland thrown upon the water. It is reported to lie eastward and southward of its charted position; according to observations by the officers of the German cruiser *Cormoran*, 1901, the S.W. point is in lat. 1° 54′ N., long. 173° 26′ E. The inhabitants number about 1,900, and there are mission and trading stations.

The boat passage into the lagoon is about 1½ mile northward of the S.W. extremity of the atoll, and a conspicuous white stone pyramid beacon stands on the reef on its northern side, forming a good mark. There is anchorage off this, in 15 fathoms; and also close along the West side of the reef, but only in the finest weather.

Mr. Moors says the most convenient anchorage is in about 18 fathoms, off the large village of *Raoua-nawi*, on the North end of the island, just off a point of heavy breakers, in the bight around which there is no good anchorage. Here there is a good boat passage through the shore reef. H.M.S. *Miranda* anchored here in 14 fathoms, very close to the reef. The fringing reef extends about three-quarters of a mile off the N.W. point of the atoll.

Page 949.—**TARITARI or MAKIN** is commercially the most important of the Gilbert group, being the headquarters of the trading firms engaged there. It contains about 3,000 inhabitants. Supplies of good water, firewood, fresh and other provisions can be had; coal is also kept in store, and in 1901 H.M.S. *Pylades* got about 60 tons at 42*s.* 6*d.* per ton. Mr. Moors says the lagoon is the easiest to enter of the Gilbert group, there being several safe passages, of which the southernmost is the best.

Sailing vessels are advised to approach Taritari from the South or East, on account of the prevalent easterly winds and to obtain a pilot before entering the lagoon, as the tides run strongly. The best channel is between the main island and *Entrance Islet* (the white house on which no longer exists); it is about half a mile wide, but there are several coral heads in it. At 2 miles within the entrance is a sunken reef near its centre, on which stands a beacon, and vessels entering should steer N.E. for this and leave it close to port. Keep well out north-eastward into the lagoon, before standing southward towards *Butaritari*, where there is a long wharf, at the shore end of which stands a large shed with an iron roof. Large vessels lie in 7 fathoms, about $1\frac{1}{4}$ mile off the wharf; small vessels can lie in $3\frac{1}{2}$ fathoms, half a mile off. By following the track laid down in the plan, not less than 10 fathoms will be found up to the anchorage. It is high water, on full and change, at 3h. 30m.; springs rise $6\frac{1}{2}$ feet.

There is reported to be good anchorage in 5 to 10 fathoms, off Passage Point, southward of the southern entrance; also westward of Nakudi and Pakhat Islands, the latter lying at the N.W. extreme of the atoll.

About 3 miles westward of the N.E. extreme of the atoll of Taritari is an islet, westward of which is a boat passage, much used for communicating with Little Makin.

The South point of Taritari is now charted in lat. 3° 0′ N., long. 172° $46\frac{1}{2}$′ E.; Entrance Islet in lat. 3° 4′ 27″ N., long. 172° 44′ 50″ E.; and the North extreme in lat. 3° 12′ N., long. 172° $42\frac{1}{2}$′ E.

LITTLE MAKIN, or Pitt Island, had about 400 inhabitants in 1901; it is fertile, with a fresh-water lagoon containing good fish. It has no harbour or anchorage, and boats usually land near the village on its S.W. side. The N.E. point of the atoll is now charted in lat. 3° 18′ N.

Pages 949-950.—**PAANOPA, Banaba, or Ocean Island**, included in the British administration of the Gilbert group, is now considered to be in lat. 0° 52′ S., long. 169° 35′ E. (centre). Large quantities of phosphate of lime are now shipped here. For particulars see pages 250-251 of the Addenda to Findlay's Directory for the South Pacific Ocean.

Page 950.—**NAURU, Nawodo,** or *Pleasant Island*, came under German domination in 1888, and is attached to their Marshall Islands administration, the resident official's house being on the S.W. coast, in lat. 0° 26′ 3″ S., long. 166° 56′ 9″ E. There is a phosphate shipping settlement here, and a large mole is being constructed across the reef. For other particulars, see pages 251-252 of the above Addenda.

Pages 950-952.—**The MARSHALL ARCHIPELAGO** is scattered over the area between lat. 4° 34′ and 14° 50′ N., including Ebon on the South, the isolated Taongi on the North, and Eniwetok and Ujelang to the westward. It is now a *schutzgebiet* (protectorate) of Germany, by the Anglo-German agreement of 1885, the seat of the local government being at Jaluit.

The islands or atolls are thirty-four in number, their *land* area being estimated at about 165 square miles. In 1906, the native population was estimated at about 15,000, but, being so nomadic, it is difficult to number them. Their chiefs still exercise considerable power, but the spread of trade and the influence of the missionaries have deprived them of their former warlike proclivities, and they are now indolent, and friendly to Europeans. They subsist chiefly on the fruit of the pandanus, breadfruit, arrowroot, cocoanuts, taro, plantains, and fish, the soil being too scanty for general cultivation. They also keep pigs and poultry, but there is no grass for cattle or sheep.

The commercial prosperity of the islands practically depends upon the production of copra, the annual export varying from 2,500 to 3,000 tons. Shark-fins are also sent to China, but the collection of phosphate, red and pink coral, sponge, and pearl-shell has not been a financial success. The trade of the islands is now practically in the hands of the Jaluit Company, of Hamburg, and no vessels are allowed to trade with the islands without a permit, under a heavy penalty, Jaluit being the only port of entry. In 1906, the resident Europeans numbered 83, of whom 48 were at Jaluit. The currency here is German coin, silver being legal tender to any amount.

Climate, &c.—The climate is comparatively healthy for Europeans, but the heat and moisture are unfavourable to those suffering from complaints of the heart and lungs.

During a series of 3 years observations at Jaluit, the temperature varied between extremes of 95° and 70° F., being very uniform throughout the year. The average annual rainfall was 177 inches, nearly equally distributed throughout the year, and occurring almost daily. The sky is often cloudy, and only in January and February may comparatively dry weather be expected. Thunderstorms are infrequent, and mostly occur from July to September. There are no records of earthquakes.

Page 952.—*Winds.*—Jaluit, and the more southern atolls of the Marshall group, appear to lie near the limit between the N.E. and S.E. trades, but easterly winds prevail. Here the N.E. trade usually blows from December to April, but in some years may fail to reach this region; it becomes more easterly and S.E. from May to November, while calms and S.W. storms may occur from August to November. During the N.E. trade the weather is often squally, the wind shifting from N.E. to East, and even to S.E. and South, and then back again.

In the more northern atolls the N.E. trade blows more persistently as the latitude increases, and fine dry weather prevails from December to April.

Hurricanes occur at intervals and cause much destruction to the cocoanut plantations, the attendant flood waves sometimes washing them completely away. On June 30, 1905, the settlement at Jaluit was almost destroyed by a hurricane and flood wave, the wind backing from N.W. through West and South to S.E. It was also experienced at the atolls of Arhno, Majuro, and Mille, causing great havoc and loss of life.

Currents.—The numerous observations made during recent years confirm the statement as to the uncertainty and irregularity of the surface currents in this region, and they appear to be much influenced by the wind, especially between November and March, when the prevalence of the N.E. trade is said to overcome the easterly counter-current. At this season, between lat. 4° N. and 3° S., a westerly current has been observed to set 36 miles in 24 hours, and then no current for one or two days, then E.N.E. for several days, and then back to West and N.W., and so on. Thus, in November, 1892, the German cruiser *Sperber*, on the passage between Mille and Nauru experienced an easterly set, and on the return passage 3 days later the current was setting westward.

From April to October, the currents appear to be somewhat more regular, running East and E.N.E., one-half to 2 knots an hour, between lat. 4° N. and 8° N. Between lat. 4° N. and 8° S., it may run between W. by S. and N.W., 2 knots an hour, but occasionally an easterly set, or no current, will be found. During a cruise through the Marshall group, in July and August, 1895, the German cruiser *Möwe* felt little or nothing of the easterly counter-current.

Captain Krieg, German cruiser *Falke*, says that eastward of Jaluit the easterly Equatorial counter-current is diverted north-eastward and northward by the north-westerly set from the Gilbert Islands. After the N.E. trade has been blowing strongly this north-westerly set, westward of Jaluit, appears to divert the easterly counter-current to the northward and north-westward. The northern boundary between the regular westerly and easterly currents was found in about lat. 7° N., westward of the Marshall group, but this was not so noticeable when among the islands, a northerly set being experienced as far as lat. 10° N.

The Ratak (sunrise) and Ralik (sunset) chains have not been accurately surveyed, and doubt still exists as to their dimensions and positions on the chart, which, however, is practically sufficient for the purposes of ordinary navigation. German authorities state that the whole group is charted about 4 miles eastward of its true position, thus explaining why so many vessels coming from the South to Jaluit first make the eastern point of that atoll instead of the South end as expected.

We may here make a few remarks as to the curious charts formerly in use among the expert seamen of the Marshall Islands. These were frames of thin sticks or strips of bamboo, on which the positions of the atolls were indicated by means of shells, pebbles, seeds, or knots of cocoanut fibre, and the courses, and direction of the current (or, rather, swell of the sea), by curved sticks. For full and well illustrated accounts of these "charts", the reader is referred to the work entitled "Die Stabkarten der Marshall-Insulaner," by A. Schück, Hamburg, 1902; or to a translation of an article by Captain Winkler, of the German Navy, appearing in the "Annual Report of the U.S. Smithsonian Institution," for the year ending June 30, 1899, pp. 487-508.

Directions.—The surface of the islands averages from 3 to 12 ft. above sea-level, but in a few places, as at Likieb, sandhills may reach an elevation of 40 feet. In clear weather, the trees on them may be seen from deck at a distance of 8 to 12 miles. There is no danger in approaching them, as the reefs are steep-to, especially on their eastern sides, and the lead is useless. A stranger should not attempt to enter or navigate the lagoons without the assistance of local knowledge. Vessels coming here must be well provided with stores, as but few supplies are to be had.

Among the many authorities consulted for the foregoing and following description may be mentioned the numerous references in the "Annalen der Hydrographie" and the "Pilote" to cruises made by German vessels among the group; the "Jahresbericht der Deutschen Schutzgebieten;" and an interesting paper by Dr. Steinbach, read at the Berlin Geographical Society, 1895. Some notes are also taken from a cruise by Capt. C. Jeschke, described in "Petermanns Mitteilungen," December, 1906.

Pages 952-954.—**MILLE,** before the destructive hurricane of June 30, 1905, had about 700 inhabitants, living on the southern and western islands. The anchorage in the lagoon, off the island of *Mille*, is approached from Port Rhin, but is not usually safe during October and November, owing to the sea raised by the N.E. trade wind. At this season the best anchorage will be found on the eastern side of the lagoon, off a trading station; the German cruiser *Falke* anchored here in 13 fathoms, sand, entering the lagoon by *Ennanlik Passage*, about 14 miles eastward of Port Rhin, and found little difficulty in the navigation, steering a direct course S.E. ¼ E. through the lagoon to the anchorage.

Lukunor, at the S.E. extreme of Mille atoll, has good sheltered anchorage northward of it, but the passage westward of it into the lagoon is only 20 or 30 yards wide, with 11½ ft. water.

Knox Islands, 3 miles southward of the S.E. extreme of Mille, lie on an atoll 5 miles in extent E. by S. and W. by N., there being a boat passage at the western extreme into the lagoon.

Pages 954-955.—**Keats Bank.**—The existence of this bank has not been confirmed; it is still retained on the charts. It is known to the natives as *Lim-ja-li-lae*, and was formerly visited by them for fish.

Page 955.—**MAJURO,** according to the partial survey by the officers of the German war-vessel *Bismarck*, in 1886, is about 24 miles in extent E. by S. and W. by N., by 3 to 6½ miles in width, and now contains about 1,800 inhabitants. The main entrance to the lagoon, on the North side of the atoll, passes close eastward of *Calalin Island*, the West point of which is in lat. 7° 9′ N., long. 171° 13′ E. It is easy to navigate, and when within the lagoon the course should be altered to E. by S., for about 10 miles, till the buildings of the trading and mission stations at the East end of the lagoon come into view, when alter course to E. by N. ½ N. for the anchorage, in about 12 fathoms, 2½ miles farther on, eastward of a detached reef marked by a pole.

Fordyce Channel, between Majuro and Arhno, is about 7 miles in width, and very deep.

Pages 955-957.—**ARHNO** is about 60 miles in circumference, according to more recent observations, and appears to be inaccurately charted. In 1906, the inhabitants numbered about 1,600, and there are several mission stations. Captain Fischer, of the German cruiser *Sperber*, reported that the N.E. point extends 4¼ miles farther northeastward, and the S.E. point to be 7 miles northward of the charted position. At the northern end of the atoll is a group of islets enclosing a small lagoon, accessible to boats at high water. The positions given (pages 956-7) by Commander Meade, U.S.S. *Narragansett*, differ widely from the chart now in use.

Tagelib Passage is westward of *Tagelib* or *High Island*, which, according to the German chart, is in lat. 7° 0′ N., long. 171° 44′ E. The German cruiser *Nautilus* passed through it, finding a least depth of 2¾ fathoms, and it is recommended as preferable to the *Eastern Passage* (in which there is a 10-ft. patch) for vessels of moderate draught. Depths of 15 to 23 fathoms were found in the lagoon between this and the anchorage off the trading station on *Ine Island*, at the South end of the lagoon, where is the principal village.

Dodo Passage is said to be about 12 miles westward of the N.E. point of the atoll, between the fifth and sixth islands westward of Tagelib. It is wide and easy to use, and the local pilot recommends it in preference to the others.

Page 957.— **Neptun Reef.**—In 1904, the captain of the German trading schooner *Neptun* reported having seen a reef far eastward of Arhno Atoll, in about lat. 7° 6′ N., long. 172° 25′ E. It was unsuccessfully searched for by the German war-vessel *Condor;* but the natives say there is a reef in this locality, named by them *Wour-en-lal*, where they used to fish.

Page 957.—**AURH.**—The captains of the trading vessels believe a submarine ridge connects the N.W. point of Arhno with Aurh, as when the N.E. trade blows strongly a heavy cross-sea is met with here.

The western extreme of *Bigen* or *Pigen Island*, according to the officers of the German cruiser *Seeadler*, 1900, is in lat. 8° 22′ N., long. 171° 7′ E.; the S.E. end of the atoll is now charted in long. 171° 17′ E. The lagoon has depths of 30 to 45 fathoms between the reefs, but there is anchorage in 6 to 12 fathoms off *Tabal* in the N.E. angle, and off *Aurh* in the S.E. The best entrance is through the western reef, about 4 miles South of Pigen, and was used by the German cruiser *Nautilus*; it is about 2¼ cables wide, and deep enough for any ship, but somewhat difficult. The course in is first S.E., and then E.N.E.; when within the lagoon, the course is first N.E. to avoid some drying reefs, and then East for Tabal. The other two entrances are reported as navigable only for vessels up to 12 ft. draught. In 1906, the inhabitants were only about 300 in number.

Pages 957-958.—**MALOELAB** is one of the largest and wealthiest of the Marshall Islands. According to a partial survey by Captain C. Domnick (the German pilot), the atoll is about 35 miles in extent N.W. and S.E., with an average width of 15 miles. The lagoon has depths of 30 to 40 fathoms, and is comparatively free from coral patches. On the North and East the reef is continuous, but on the western side there are seven navigable passages through it.

South or *Bogen Passage*, about 5 miles from the South extreme of the atoll, is narrow but deep, and will be easily recognised by the sandy islet lying within it. In entering, pass eastward of this islet, whence a course about N. by E. ½ E. for 12 miles will lead to the anchorage off Taroa, and N.E. ¾ E., 4 miles, to that off Airik.

Eni-Juon Passage, about 4½ miles north-westward of South Passage, will be known by the island on its N.W. side, the first from South Passage. It is about 300 yards wide, with a least depth of 9 fathoms, and, having no obstruction in it, is said to be the best channel into the lagoon. In using it, keep in mid-channel or over towards the island. Hence to the anchorage off Taroa the course is about N.E. ¼ N., 12 miles.

Taroa or *Torua* lies on the eastern angle of the atoll, in lat. 8° 42½′ N., long. 171° 17′ E.; it has a trading station, and is the residence of the chief. There is good anchorage eastward of it in 6 to 15 fathoms, sand and shells. There is also anchorage in 14 fathoms off *Airik*, 9 miles southward.

The other good entrances to the lagoon are that North of *Bebi*, and that South of *Kaven*, the latter island now being charted in lat. 8° 55′ N., long. 170° 56′ E.

Page 958.—**ERIKUB** is of no commercial importance, and is seldom visited. But little is known of it, and the South end is reported to be charted 8 miles too far South. The lagoon is said to be comparatively free from coral patches; it has a narrow entrance on its eastern side, and an apparently wide and deep one at its S.W. end.

Pages 958-959.—**WOTJE** now has about 350 inhabitants. The lagoon contains numerous coral heads and patches, but can be entered and navigated by vessels of any size. *Rurick Pass*, 5½ miles southward of the N.W. end of the atoll, is about 250 yards in width, with deep water. *Schischmareff Pass* is about 300 yards wide, and deep.

Page 959.—**LIKIEB** is one of the important atolls of the Marshall group, having extensive cocoanut groves. Its lagoon, however, is said to be one of the most difficult of navigation, owing to the innumerable coral patches in it. The atoll appears to be incorrectly charted, and the N.W. part is reported to lie farther westward, or in long. 168° 57′ E. *Likieb Island*, according to the officers of the German cruiser *Möwe*, is in lat. 9° 49′ 32″ N., long. 169° 19′ 15″ E.; the anchorage here is completely sheltered by reefs and islets, and the sandy beach is utilised for heaving down trading vessels. Boats and small sailing vessels are built here.

South Pass is easy to make out by the small island just inside it. Westward of this islet is a dry sandbank, thus forming three channels, of which that eastward of the islet is considered the best. Hence to the anchorage off Likieb the best route passes eastward near the atoll reef.

JEMO is visited by the natives of Likieb and Ailuk for catching turtle. In 1902, observations on board the German cruiser *Cormoran* placed it in lat. 10° 5′ N., long. 169° 31′ E., or 11 miles westward of its charted position.

Page 960.—**MEJIT** now has about 200 inhabitants, and trading and mission stations. Phosphate rock has been found on it. There is no lagoon or harbour, and no anchorage off it. Surf-boats can land on the S.W. side in fine weather, but from December to April it is sometimes impossible.

AILUK.—In 1892, the captain of the schooner *Golden Fleece* reported the existence of dangerous breaking reefs extending about 15 miles northward and W.N.W. from

Capeniur Island, but in 1895 the German cruiser *Möwe* twice passed this locality and nothing was seen of them, and the local pilots and traders say they do not exist; it appears probable that Capeniur was confounded with Ailuk at the South extreme of the atoll.

UTIRIK is about 20 miles in extent N.W. and S.E., and of triangular outline 8 miles in greatest breadth. The northern part of the atoll being sunken is dangerous of approach. *Utirik*, the S.E. island, has about 25 inhabitants, and can be reached by a boat passage through the southern reef. The lagoon is difficult of navigation, and vessels drawing up to 10 ft. can enter by a passage situated near the middle of the West side of the atoll.

Pages 960-961.—**TAKA** is about 11 miles in extent North and South, and of triangular form, about 10 miles in width at the northern and widest part. There is no good passage into the lagoon.

Page 961.—**BIKAR** is now uninhabited.

Taongi.—See the Addenda for pages 1034-1035.

Page 962.—**RONGERIK** is the native name of the *Pescadore* or easternmost of the atolls on the North side of the Ralik chain. It is of a semi-circular form, about 16 miles in extent N.E. and S.W., and has a few inhabitants.

RONGELAB, or *Rimski-Korsakoff Islands*, is about 17 miles in greatest width, at its South end.

AILINGINAE lies about 14 miles S.W. of Rongelab.

Page 963.—**BIKINI** is rarely visited and little known. The southern entrance to the lagoon is charted in lat. 11° 33′ N., long. 165° 37′ E.

WOTTHO now has about 30 inhabitants.

Page 964.—**UJAE** is about 22 miles in extent, and 8 miles in greatest width near the centre, with about 200 inhabitants. It is reported to lie about 9 miles southward of its charted position, and observations taken on the U.S.S. *Iroquois* placed it about 22 miles farther westward. According to astronomical and other observations, in 1897 and 1899, by Captain Schack, of the German cruiser *Seeadler*, the anchorage near Ujae is in lat. 8° 56′ N., long. 165° 50′ E. Northward of Bock island the reef has depths of 3 to 8 fathoms over it for several miles, affording access to the lagoon for vessels of any size.

LAE has eight islands upon the atoll, with about 200 inhabitants, and is reported to lie 10 miles westward of its charted position. The entrance to the lagoon has depths of 2½ to 5 fathoms, and the sunken reef here extends a little seaward, with depths of 10 to 15 fathoms, where vessels may anchor in fine weather with off-shore winds. According to Captains Schack and Domnick this anchorage is in lat. 8° 58′ N., long. 166° 13′ E. Copra is made here.

Pages 964-965.—**KWAJALONG or Menschikoff Islands.**—*Kwajalong* or *Kwajalein* is now charted in lat. 8° 44′ N., and has trading and mission stations on it. Hence the south-western side of the atoll trends in a curve to *Ebadon*, now placed in lat. 9° 22′ N., long. 166° 53′ E., the direct distance being about 66 miles.

Pages 965-966.—**NAMU** is about 34 miles in extent N.W. ½ N. and S.E. ½ S., and from 3 to 7 miles in width, and is identified by Mr. H. B. Guppy with the *San Bartolomeo Islands* of Gallego, 1568. It has about 1,300 inhabitants, and encloses one lagoon, which was traversed by the German gunboat *Eber* from end to end, but is difficult of entry by sailing vessels. There is a passage close southward of *Bock Island*, in lat. 8° 6′ N., and another about midway between this and the southern passage.

Page 966.—**ODIA or Ailinglab.**—There are trading and mission stations here.

JABWAT has about 50 inhabitants, and is now charted in lat. 7° 41′ N., longitude 169° 6½′ E.

Pages 966-967.—**JALUIT** is about 34 miles in extent, and 85 miles in circumference, the islands on the atoll being 55 in number. It is the most important of the Marshall group, being the government and trading headquarters.

Jabor is described as a melancholy and unhealthy settlement, owing to the dampness and heat of the climate (see the Addenda for pages 952-953), but all vessels must be entered here before visiting the other atolls of the Marshall group. The inner end of the landing pier at the North end of Jabor Island is in lat. 5° 55′ 7″ N., long. 169° 39′ 31″ E. Cargo is landed and shipped by means of lighters. Supplies of fresh provisions, such as

beef, pork, fowls, and eggs are usually scarce and dear, and the stores and Australian coal are only sufficient for the use of the local government and trading vessels. Rain is depended upon for fresh water, which is stored in large tanks. A steamer, running between Sydney and Hong Kong, calls here about every two months.

Pilots may here be obtained for the Marshall group, and pilotage is compulsory for vessels visiting Jabor. Vessels are advised not to approach the S.E. Passage within 1 or 1½ mile, on a W.S.W. bearing, until boarded by the pilot; and in approaching from the South point beware of the usual set towards the reef. Anchors and cables should be clear for immediate use.

S.E. Passage offers no difficulty to a large sailing vessel with a favourable wind and tide, the latter sometimes running 7 knots an hour at neap tides. Great care must be observed in approaching at night or in thick weather, the land being so low, and the depth outside far too great for the lead or for anchorage.

The anchorage westward of Jabor has good holding ground, and the tidal streams are not felt. Vessels staying here are advised to moor, especially from June to November when westerly winds may cause a considerable sea. The North and South shoals were not marked by buoys, but the reef near the middle of the anchorage was marked by a spar bearing a cask.

It is high water, on full and change, at 3h. 30m.; springs rise about 6 feet.

S.W. Pass, midway between the southern extreme of Jaluit Island and *Pinglap* at the western extreme of the atoll, is about 7 miles south-westward of Jabor. It has several bends in it, and the tidal streams run 3 to 4 knots an hour. Local knowledge is necessary for its safe navigation.

Anchorage has been found close to the atoll, north-westward of Pinglap.

Page 968.—**KILI** is only about a mile in extent, but the reef reaches more than a mile off its S.W. point, on which there is exposed anchorage in 5 to 15 fathoms. It is planted with cocoanut palms, looked after by a few natives. According to careful observations by the officers of the cruiser *Seeadler*, in 1900, the S.W. extreme of the island is in lat. 5° 38′ N., long. 169° 11′ E., or about 3 miles northward of the charted position.

Page 968.—**NAMORIK.**—Landing is only possible in fine weather, on the western side.

EBON is reported to be larger than shown on the chart, the atoll having a diameter of 8 to 10 miles, and care must be exercised in approaching its northern side where the reef is very low. It contains about 2,000 inhabitants, but the chief mission and trading stations have been removed to Jaluit. The lagoon is seldom entered by sailing vessels, the entrance being so narrow and winding, but there is good anchorage in its S.W. part, in about 13½ fathoms. There are trading stations on *Juridi* (Jurij) and *Meidj* (Mej) *Islets*. According to the pilot Capt. C. Domnick there is good anchorage in 5 to 15 fathoms, on the reef extending westward from the West side of *Ebon Island*.

Page 969.—**ENIWETOK,** according to a sketch plan by Capt. Domnick, is a nearly circular atoll 19 to 24 miles in diameter, with about 35 scattered islets around it. *Eniwetok* or *Parry Island*, at the South extreme, is the largest, and is about 3 miles in extent, the surface in places rising about 23 ft. above sea-level; its West point is in lat. 11° 22′ N., long. 162° 19′ E., or about 6 miles southward of its charted position. This and several of the larger islets have been planted with cocoanuts, and the inhabitants number 60 or 70. In case of need, a little fresh water might be had at Eniwetok.

The lagoon has general depths of 19 to 30 fathoms between the scattered reefs in it. There is anchorage in 17 fathoms off Eniwetok Island; and in 8 to 12 fathoms off Engebi Island, in the northern angle of the lagoon. There are three deep entrances, on the S.E., South, and S.W. sides of the atoll. That on the S.E., at 2½ miles north-eastward of the N.E. extreme of Eniwetok, is narrow, and within it is a detached islet named *Began*. Immediately westward of Eniwetok the reef sinks, and has depths of 7 to 11 fathoms over it for a distance of about 6 miles, forming a wide and easy access to the lagoon. The S.W. pass, 12½ miles westward of Eniwetok, is narrow with depths of 4 to 7½ fathoms.

The positions given for Arthur Island, etc., are affected by Captain Domnick's observations (above).

Falcon Breakers.— In 1894, Capt. J. Carlston, schooner *Falcon*, saw occasional heavy breakers extending about 5 miles north-eastward from Engebi; when about 1

mile off their extremity he found bottom at 75 fathoms. They are not shown on Capt. Domnick's plan.

Pages 969-970.—**UJELANG, or Ujilong**, is about 13 miles in extent, and 3 to 4 miles in width. The eastern extreme is in lat. 9° 42′ N., long. 161° 3′ E. The lagoon is easy to navigate.

Pages 970-972.—**The CAROLINE ARCHIPELAGO** is scattered over an area about 1,500 miles in extent East and West, between Kusaie and Yap, or the meridians of 163° 10′ and 137° 20′ E., and the parallels of 3° 50′ and 10° 10′ N. ; but the actual area of dry land is estimated at only 1,200 square miles, or about that of the county of Durham, the number of islands being about 450. These islands, with the Pelew and Mariana Islands, were ceded by Spain to Germany, in 1899, for a cash payment of 25,000,000 pesetas, or about £850,000. They are now administered by the government of German New Guinea, etc., a deputy governor being stationed at Ponape. For administrative purposes they are divided into two groups, the Eastern Carolines eastward of longitude 150° E., and the Western Carolines (including the Pelews). Vessels visiting them must first enter at Ponape or Yap respectively, to obtain the requisite permission.

The natives are now estimated to number about 40,000, and are mostly friendly to Europeans, owing to the influence of the missionaries and government officials. Several languages are spoken among them, which have been grouped into six dialects, of which that spoken in the Mortlock and central islands is the one in general use for trading purposes. They are an indolent race, subsisting chiefly on the cocoanut, bread-fruit, pandanus, taro, and other tropical productions, while the sea yields fish in abundance. Pigs and poultry are also kept.

The commercial products are confined to copra, trepang, tortoise-shell, and pearl-shell, valued at about £20,000 annually, of which copra (1,800 to 2,000 tons) represents about three-quarters. Trading vessels must have a license. The resident Europeans numbered 150 in 1906. The currency is German, but trade is chiefly carried on by barter. Ponape is in regular steamer communication with Sydney, the Marshall Islands, German New Guinea, and Hong Kong, and Yap is now connected with the submarine telegraphic system.

Pages 972-975.—**Climate, Etc.**—In most parts the climate is healthy for Europeans, the great heat being tempered by the winds. The N.E. trade usually blows from October to May, and is followed by the S.W. monsoon during June, July, and August, though easterly winds are also then experienced at times. Heavy gales are frequent during the N.E. trade season ; and in November, December, and June, at the changes of the seasons, destructive typhoons occasionally occur. On April 19-20, 1905, a typhoon devastated Ponape and the eastern islands, an earthquake being simultaneously experienced at Kusaie. Again, on August 28, 1906, another earthquake was felt at the Namonuito group. At the end of March, 1907, the central and western islands were again devastated by a hurricane and accompanying flood wave, full particulars of which are given in an article in the "Annalen der Hydrographie," *November*, 1907, pages 501-505.

Page 974.—**Currents.**—As already stated, the direction of the surface current is much influenced by the winds in the region of the Caroline Islands, which lie on the boundary between the North Equatorial westerly current and the easterly counter-current. Thus, on a voyage between the Pelew Islands, Ponape, and Kusaie, in August to September, 1898, the German war-vessel *Arcona* experienced sets varying between S. 32° W. and N. 16° W., running from 3 to 32 miles per day, where the easterly counter-current was to be expected. From Kusaie to Jaluit, the set was from N. 66° W. to N. 69° W., 28 miles on the trip. Returning from Jaluit, at the end of September, sets from S. 41° E. to S. 75° E., 8 to 25 miles a day, were found till in lat. 8° 21′ N., long. 162° 49′ E. ; and on keeping along the parallel of about 11° N., as far as long. 141° 18′ E., the set varied between N. 79° E. and N. 69° W., from 4 to 27 miles a day. Other observations record very similar experiences.

Page 975.—The charts of this region must be used with the greatest circumspection, for in many parts they are mere sketches, and the correct positions of the various atolls still remain in doubt. Telegraphic observations in 1906 show that Yap lies 4¾ miles eastward of its charted position, and similar discrepancies probably exist with regard to the other islands.

For the foregoing and following description we are indebted to numerous articles in the "Annalen der Hydrographie" and other German publications (see Addenda for page 952). The reader is also referred to "The Caroline Islands," by F. W. Christian, 1899, containing an interesting account of the islands and their inhabitants, &c., of

which a condensed article appears in the "Geographical Journal," *February*, 1899, pages 105-136.

Pages 975-976.—**KUSAIE, Kuthiu, or Ualan**, is about 8 miles in extent N.E. and S.W., and the fringing reef extends a mile off the N.W. side. *Fulaet* or *Mount Crozer* is about 2,300 ft. high, and may be seen 50 miles off in clear weather. In 1903, the population numbered about 450, all nominally Christians, there being a large mission station at *Mout*, on the N.W. coast. Cattle are bred here, so that supplies of fresh beef may be had.

Page 977.—**Lele** or *Chabrol Harbour* entrance is about a cable wide, and easy to navigate. The harbour affords excellent anchorage in 8 to 15 fathoms, over an area about half a mile in extent, and in approaching vessels should only pass northward of the middle reef. Vessels usually anchor between the inner reef and the village, where fresh supplies, beef, and water may be had. In fine weather, a native pilot will come off to an approaching vessel. Mr. Christian gives a good description of the massive stone walls of prismatic basalt of Pot Falat, on Lele Island, which are inferior to the similar ancient remains on Ponape. The village is in lat. 5° 20′ N., long 163° 0′ 45″ E., according to observations on the U.S.S. *Alliance*.

It is high water in the harbour, on full and change, at 6h.; springs rise 4½ feet.

Coquille or *Wuokat Harbour* has a clear entrance about a cable wide, and there is good anchorage in 13 to 15 fathoms at its head, over an area about one-third of a mile in diameter. The N.E. islet is now considered to be in long. 162° 56′ E.

Port Bérard, 1 mile southward of Coquille Harbour, is an inlet a cable in width, with anchorage near its head in 8 fathoms.

Port Lottin entrance is 1½ cable wide and deep, and the harbour affords good sheltered anchorage, easy of access.

Pages 977-978.—**Mackaw** or *Indiana Reef* is reported to have several feet of water over it. *Atlantic Island* was not seen from the French cruiser *Dayot*; this, and the *reef* in lat. 2° 25′ N., long. 153° 50′ E., have been removed from the chart.

Page 978.—**PINGELAP** now contains about 900 inhabitants, *Michor*, the principal village, being on the western side of *Pingelap*, the southern and largest island, where boats can land in fine weather. There is no known anchorage around the atoll, and there is no channel into the lagoon. *Tugulu* or *Chikuru* is now placed in lat. 6° 14′ N., long. 160° 45′ E. The natives are now under control; they cultivate the banana, breadfruit, taro, &c., and keep pigs and fowls.

Pages 978-979.—**MOKIL** now has over 200 inhabitants, living on *Manton* and *Kalap Islands*; they make good sailors. There is no known anchorage here. In 1907, it was announced that astronomical observations placed the islands about 6 miles westward of their charted position.

Page 979.—**PONAPE.**—The lagoon is navigable for large boats from Santiago Harbour round westward nearly to Kiti Harbour, and eastward to the mission station at Oa. In other parts it is only fit for small boats.

Ponape is the headquarters of the German administration of the Caroline Islands, the settlement being at Messenieng, in Santiago Harbour. In 1903, the native population numbered 3,226, all living in scattered villages near the coast, the interior of the island being an almost impenetrable wilderness of wooded mountains. The commercial productions are chiefly copra and ivory-nuts. Mr. Christian gives an interesting account of the island, and of his explorations among the prehistoric ruins; a very complete description is that by Dr. A. Cabeza, in the "Boletín de la Sociedad Geográfica de Madrid," tomo xxxiv, pages 7-68.

Page 982.—*Chokatch* or *Jekoits Island*, eastward of Santiago Harbour, has a remarkable precipice 937 ft. high on its North side, of basaltic columnar formation.

Pages 983-984.—**Kiti or Rono Kiti Harbour** entrance is now charted in longitude 158° 12½′ E., at the S.W. extreme of Ponape. A native pilot will come off to a vessel approaching. It is high water here, on full and change, at 3h.; springs rise 6 feet.

About 4 miles north-westward of Nalap Islands is *Kapara Islet*, on the edge of the barrier reef, near which a spring of fresh water wells up through the coral.

Pages 985-986.—*Mutok Harbour*, about 6 miles eastward of Kiti Harbour, was used by whalers, but the entrance is narrow. *Lod* or *Lot Harbour*, at the S.E. extreme of Ponape, is also only fit for small vessels.

Metalanim Harbour entrance is 3½ cables wide. Some fresh supplies may be had from the natives, but water is difficult to procure. On the South side of the harbour

lies *Tomun Island*, off the S.E. side of which lies a group of islets mostly artificial, occupied by the extensive ruins previously mentioned, and sheltered by the remains of a massive breakwater.

Port Aru or *Oa*, about 4 miles northward of Metalanim, has a very narrow and tortuous entrance. There is a mission station here.

LANGAR or Jamestown Harbour is approached by a deep opening through the reef, 3 cables wide, about 2 miles north-eastward of Chokach Island, the steep cliff on which forms an excellent landmark. The harbour, the best in Ponape, will afford sheltered anchorage to vessels of any size, and the approach is easy by day, the scattered reefs being marked by buoys and beacons, *red* to starboard and *black* to port in entering. Pilotage, however, is compulsory, and a pilot will come off when a vessel is seen approaching. The course in is about S.E., for one mile, when an easterly course must be taken for the anchorage off Langar.

Langar Island.—The Jaluit Co.'s trading station is on the S.W. side of the island, and has a good landing stage for lighters at its western end, in lat. 6° 59′ 45″ N., long. 158° 17′ 29″ E. On the South point of the island is a coal store, with a pier, at which vessels can lie for coaling only. Other cargo is dealt with by boats or lighters. Fresh and other supplies, including beef, may be had here, and water from the river.

Vessels anchor off the settlement, in about 27 to 30 fathoms, well sheltered from north-easterly winds. A mooring-buoy lies 1½ cable off the coaling pier. At 8½ cables south-westward of Langar is *Ferreol Island*, eastward of which is the inner anchorage, in 8 to 11 fathoms; there is a mooring-buoy here, in 8 fathoms. Hence southward to the German government station at *Messenieng*, a distance of one mile, the boat channel through the reefs is marked by beacons. It is situated on the western side of the shallow inlet known as *Santiago* or *Ascension Bay*.

It is high water at Langar, on full and change, at 3h. 5m.; springs rise about 4¼ feet. The streams are weak, running eastward and westward.

Peleker Harbour, westward of Langar Harbour, is a spacious deep basin with a clear entrance between the reefs.

Page 986.—**ANT or Endema Islands** are reported to be incorrectly placed on the chart, on which the South island is shown in long. 157° 57′ E. The atoll is about 6 miles in extent, East and West, by 3½ to 5 miles in breadth, and there is an islet on its West side. The four larger islands are named Pacha, Kahlap, Palientopata, and Panemuk; the inhabitants number about 30. The lagoon entrance passes southward of *Kahlap*, the largest island, but the tidal stream sometimes runs 5 knots an hour in it; trading vessels enter, and find sheltered anchorage westward of Kahlap, in 3 to 6 fathoms.

In calm weather, the barrier reef must be approached with great caution, as it may then not be marked by breakers.

Page 987.—**Pakin Islands** consist of five islands and six islets, lying on a narrow reef; they are now charted about 4 miles eastward of the given positions.

Pages 987-988.—**NGATIK**, according to an examination by the officers of the German war-vessel *Seeadler*, in 1900, is about 10½ miles in extent East and West, by 4½ miles in greatest breadth, its western part narrowing to about a mile. There are islands at its eastern, western, and northern extremes, the principal being *Ngatik*, at the western end. This island contains about 230 inhabitants, many speaking English, and its S.W. point is in lat. 5° 45′ N., long. 157° 15′ 30″ E. The lagoon entrance is on the southern side, about 3 miles westward of *Uat* the eastern islet, but it is only 20 yards across where narrowest; it should only be attempted at slack tide. There is no anchorage outside the reef.

Page 988.—**NUKUOR.**—According to the officers of the *Seeadler*, the atoll is oval, about 4 miles in extent East and West, and 3 miles North and South. The islands, about 48 in number, occupy the northern, eastern, and southern sides, there being none on the western side; there are about 130 inhabitants, all living on the largest island on the S.E. side, and many speak English. Copra is made here, and pearl-shell is found in the lagoon. A few fresh supplies, such as pigs, fowls, taro, bread-fruit, &c., may be had here. The atoll is now charted 3 miles eastward of the given position. An interesting description of the people, &c., is given by the late Dr. J. S. Kubary, in the Proceedings of the Hamburg Geographical Society, 1900, pages 71-138.

Matador Island has been searched for in vain by trading vessels, and is believed not to exist.

GREENWICH, Kapenmailang, or *Kapinga Maringi Islands* have about 200 inhabitants, and are attached to the administration of German New Guinea, &c.

Page 989.—**ORALUK** is but little known, and the reef should be approached with caution. The atoll is about 20 miles in extent East and West, by 11 miles in width, enclosing a deep lagoon, to which there are several entrances. *San Augustino Island* is only three-quarters of a mile long, and is low with a few cocoanut palms on it. *Baxo Trista* is only a few feet high.

The reef reported by Mr. Bray in lat. 7° 25′ N. is placed in lat. 7° 24′ N., long. 156° 17′ E., by the officers of Spanish war-vessels.

Page 990.—**Wishart or Minto Reef** was reported by Spanish war-vessels to lie 12 miles westward of its charted position. In 1889, Capt. Magrath, barque *Altcar*, passed near this reef, and saw a dry sand patch on its western extreme; the eastern end was breaking heavily.

Dunkin Reef.—In 1897, Capt. Melander, schooner *Tulenkun*, made a careful search for this reef, but found no trace of it anywhere near the charted position. In 1903, the German war-vessel *Cormoran* passed here, and no sign of it was visible.

Pages 990-991.—**LOSAP, or Lossop**, is now charted in long. 152° 48′ E., and had 434 inhabitants in 1903. The atoll is about 5 miles in extent North and South, by 1½ to 3½ miles in width. The best entrance to the lagoon is by the channel about 2 miles northward of the S.W. islet, and close southward of the large sandbank; it has 2¾ fathoms least water. In the eastern reef is a narrow passage with 3¾ fathoms least water.

Nama or *D'Urville Island* is now charted 4 miles N.W. by W. from the N.W. side of Losap atoll, or in lat. 6° 56′ N., long. 152° 41′ E. It had 326 inhabitants in 1903.

San Rafael Island, also, could not be found by Capt. Melander.

Pages 991-992.—**LUKUNOR** had 1,165 inhabitants in 1903, and yields considerable quantities of copra.

Pages 992-993.—**SOTOAN or Satauan Islands** had 1,573 inhabitants, and much copra is made here. The atoll is about 8 miles in width.

Page 993.—**ETAL** had 334 inhabitants in 1903.

NAMOLUK ISLANDS had 264 inhabitants, now friendly to Europeans. The atoll is only about 7 miles in circumference. *Amesse* is now charted in lat. 5° 54′ 15″ N.

Pages 993-995.—**TRUK, Ruk, or HOGOLEU ISLANDS** are reported to lie 8 miles eastward of their charted position, and the chart is very imperfect. The islands are about seventy in number, of which sixteen are inhabited, the population in 1903 numbering 13,115, it being the most thickly populated of the Caroline Islands. Copra is produced in large quantities, and the lagoon yields pearl-shell, tortoise-shell, and trepang; there are several mission and trading stations, and the natives are now under control. Earthquakes are occasionally experienced. The climate is hot and dry, the N.E. trade usually blowing from November to May, and westerly winds or calms from May to October, but the seasons are irregular from year to year.

The atoll is about 32 miles in extent North and South, and the same East and West, the enclosed lagoon being navigable with the usual precautions, the depth not exceeding 30 fathoms, and vessels find anchorage as convenient. *Royalist Islands* are separated from the main group by a clear channel, and are not permanently inhabited.

North-East Pass.—In January, 1901, the German war-vessel *Cormoran* entered the lagoon by this deep wide channel, which is well marked by the three wooded *Gaudichaud Islets* on its northern side, and found no difficulty in its navigation. From it a W. ½ N. course was steered northward of Falo Island, and then south-westward and South to the anchorage westward of *Moen* or *Uela Island*, in about 10 fathoms. There are trading stations on Moen, and a mission station at *Anapano* on the S.W. side.

There is another good anchorage 3½ miles southward of Moen, between *Toloas* and *Fefan Islands; Kutua* mission station stands on the eastern point of the former, and trading stations on both. According to observations by the officers of H.M.S. *Blanche*, the North end of *Tsis Islet* (off the S.W. point of Fefan) is in lat. 7° 18′ 30″ N., long. 151° 56′ 30″ E.

Udot, *Tol*, and other islands south-westward of Moen were found by the *Cormoran* to be incorrectly placed and delineated on the chart.

Page 996.—**MOURILEU.**—The atoll reef is about 20 miles in extent, N.E. and S.W., and 10 miles in greatest breadth, in its eastern part. In 1903, the inhabitants numbered 300.

NAMOLIPIAFANE, or Fananu, is the S.W. atoll of the Hall group, and contained 264 inhabitants in 1903.

Hall Islands, Los Martires, Enderby, and Suk, to the S.W., have been notorious for the piratical character of their inhabitants.

Pages 996-997.—**NAMONUITO ISLANDS.**—In 1899, Capt. C. Domnick found anchorage eastward of *Ulul*, sheltered from westerly winds. There is also anchorage in other parts of the lagoon, but no shelter from the sea.

Decapolis Shoal was reported in 1869, by Capt. Almond, of the *Decapolis*, in latitude 8° 26′ N., long. 150° 20′ E.; he passed within 1½ mile of what appeared like a large patch of breakers.

Page 997.—**Gray Feather Bank.**—In 1890, Capt. Reuter, German ship *Milly*, found only 5 fathoms, in lat. 8° 10′ N., long. 148° 45′ E. In 1899, Capt. Domnick found depths of 24 fathoms on a line between lat. 8° 40′ N., long. 149° 2′ E., and lat. 8° 10′ N., long. 149° 17′ E. These soundings may possibly form part of a large sunken atoll.

Pages 997-998.—**Los MARTIRES, or Tamatam.**—*Tamatam Islets* lie on one reef about 1⅔ mile in extent East and West, and the eastern one is now considered to be in lat. 7° 32′ 30″ N., long. 149° 32′ 30″ E. *Olap* is now charted in lat. 7° 38′ N., longitude 149° 32′ 30″ E., so that the atoll appears to be only 5½ miles in extent North and South, by 4 miles in greatest width. The inhabitants numbered 550 in 1903.

Hitchfield Bank.—In 1900, Capt J. G. Hitchfield, schooner *Queen of the Isles*, reported the existence of a bank in lat. 7° 46′ N., long. 149° 42′ E.; it appeared to be 4 or 5 miles in diameter, and he sounded in 11 to 13 fathoms, but there appeared to be less water.

Page 998.—**ENDERBY ISLANDS** are three in number, *Alet* being the westernmost. Capt. Domnick found depths of 7 to 10 fathoms for a distance of 10 miles eastward of *Poloat Islets*, the water then deepening, so that *Uranie Bank* appears to be connected with the Enderby Islands. In 1903, the inhabitants numbered 1,100.

Pages 998-999.—**Susanne Reef** appears to be the northern extreme of a large sunken atoll, Capt. Domnick having found depths of 15 to 17 fathoms (less water is reported) on a line between it and Suk Island; the reef was breaking, and appeared to be in line with Poloat when bearing N.E. by N. ¾ N. In 1886, the officers of the Spanish transport *Manila* reported the existence of a reef in lat. 7° 2′ N., long. 148° 57′ E., or about 16 miles W.S.W. of Susanne Reef; in 1891, Capt. D. F. Faulkner, of the British ship *John M. Blaikie*, reported a breaking reef near this position.

Page 999.—**SUK, or Hok,** is nearly 2 miles in extent North and South, and had 300 inhabitants in 1905. *La Paz Bank* was reported not to exist near the stated position, by the officers of the *Manila*.

Helene Reef.—In 1893, the captain of the steamer *Angers*, when in lat. 5° 33′ N., long. 149° 3′ E., passed over a narrow patch where the bottom was distinctly visible, the depth appearing to be 5 or 6 fathoms, and green water was observed stretching far to the eastward.

PIKELOT.—The atoll is about a mile in extent North and South.

Page 1000.—**SATAWAL** had 224 inhabitants in 1905, and there is a pond of brackish water near its centre. There is no anchorage here.

LAMOTREK.—Herr A. Senfft, in 1904, says there are two good passages into the lagoon, with depths of 6 to 8 fathoms, one near the N.E. end, and the other on the middle of the S.W. side; there is secure anchorage off Lamotrek Islet, in 12 fathoms. There were 287 inhabitants in 1904, and a trading station.

ELATO had 91 inhabitants in 1903. In 1862, H.M.S. *Sphinx* entered the lagoon by a passage on the eastern side of the atoll, about 100 yards wide, with 5 to 6 fathoms, and anchored southward of Elato; firewood was cut here, and fresh water found by digging.

Page 1001.—**IFALUK, or Wilson Islands**, had 281 inhabitants in 1903. In 1885, the captain of the Swedish barque *Gamen* reported a shoal of about 2 fathoms, a cable in diameter, 9 miles N.E. of Ifaluk. The officers of the Spanish war-vessel *Ulloa* reported the existence of a reef about 10 miles S.W. of Wilson Island. On March 29, 1907, Ifaluk and Oleai were swept by a hurricane and flood-wave, causing immense damage and much loss of life.

Pages 1001-1003.—**OLEAI** (*not* **Wolea** or **Ulie**) contained about 900 inhabitants in 1903, eight of the 21 islands being inhabited. There is a trading station on *Raur*, the

exports being copra, pearl-shell, and trepang; the atoll here forms a good harbour, the entrance into the lagoon, between Raur and Motogozeu, being half a mile wide and fit for the largest vessels. On March 29, 1907, these islands were visited by a cyclone and flood-waves, causing much havoc and loss of life on Raur and Paliau.

Page 1003.—**AUREPIK, or Eauripik**, had 48 inhabitants in 1903.
FARAULEP had 121 inhabitants in 1903.

Page 1004.—**GRIMES ISLAND, or Gaferut**, is placed by the German authorities in lat. 9° 14′ N., long. 145° 27′ E. In 1905, it was described as a sandbank about three-quarters of a mile in extent, with a few bushes on it and no inhabitants. The Caroline islanders say it is haunted. No anchorage was found around it.

SOROL or Philip Islands are three in number, and had 72 inhabitants in 1903. The N.W. islet is now considered to lie in lat. 8° 12′ N., long. 140° 20′ E., according to observations by Capt. J. K. Pittendrigh, British ship *Loch Eck*, in 1890. The islands extend 6 or 7 miles N.N.W. and S.S.E., with many low rocks and breakers between, and the sea was breaking fully a mile northward of the N.W. island.

FAIS, or Feis, contained about 300 inhabitants in 1905.

Pages 1004-1005.—**ULITHI, Ululssi,** or *Mackenzie Islands*, are about 30 in number, and contained 797 inhabitants in 1903, now a peaceful and law-abiding people. On March 29, 1907, the group was devastated by a typhoon, causing great loss of life. It consists of two atoll reefs, separated by a deep channel 4 miles in width in its central and narrowest part. The eastern atoll has five islets on its northern side, the remainder of the reef being sunken. The western atoll is more continuous, and there are several passages over it into the lagoon, the N.E. pass being about half a mile wide. There are depths of 18 to 20 fathoms in the lagoon, between the scattered reefs, with anchorage off the principal islands. *Mogmog*, *Mokomok*, or *Arrowroot Island*, is the chief trading place.

In 1905, the officers of the German war-vessel *Möwe* stated there was a least depth of 19½ ft. in the wide passage southward of *Thoroilen Island*, the north-westernmost of the group.

Pages 1005-1007.—**YAP** has come into prominence as the head-quarters of the German officials in charge of the western Carolines, and, in 1906, was placed in communication with the world's telegraph system by the laying of submarine cables from Menado (Celebes), Shanghai, and Guam. By means of the telegraphic observations it was then found that Guam had hitherto been charted 4¾ miles westward of its correct position.

Its Spanish and later German possessors have devoted much attention to the exploration of this interesting island, which has an area of about 80 square miles, or of 166 square miles including its barrier reef. The most complete account is that given by P. Salesius in the "Zeitschrift für Kolonialpolitik," 1906, pages 197-283 and 375-432, copiously illustrated, from which and other recent authorities the following account has been drawn up.

The island, including its reef and islets, is about 15 miles in extent N.E. by N. and S.W. by S., by 6 miles in greatest breadth, the reef extending about 3 miles south-westward of its S.W. end and 1 or 1½ mile off the N.E. end (not 5 miles as reported in 1904). In outline its form is an acute-angled triangle, with its base to the N.E. and apex to the S.W., and there are many deep channels through the reef. At its N.E. end it rises in basaltic hills over 900 ft. high, gradually declining in elevation to the S.W., where it terminates in a low sandy plain. The natives, who numbered 7,156 in 1903, are now under control; they live in scattered villages, and cultivate the productions of the tropics in their gardens, such as yams, sugarcane, bananas, oranges, &c. Tomil Bay is the port of entry for the Pelew and western Caroline Islands. Copra is the chief article of trade.

Mr. F. W. Christian describes the island as being "full of relics of a vanished civilisation—embankments and terraces (sites of ancient cultivation), solid roads neatly paved with regular stone blocks, ancient stone platforms and graves. The ruins of ancient stone fish-weirs fill the lagoon between the reef and the shore, making navigation a most difficult matter." Among other curiosities may be mentioned the *stone money*, consisting of perforated discs of limestone or arragonite from 6 inches to 12 feet in diameter, one large specimen being 9½ ft. in diameter, by 15 inches thick, and about 4½ tons in weight; they come from a quarry at Malakal Harbour, at Korror, in the Pelew Islands, and are only for purposes of display.

The Climate of Yap is comparatively healthy for Europeans, though damp, the heat being tempered by sea-breezes. It is very uniform, there being no sharply divided

wet and dry seasons, and the mean shade temperature varying only between 82° and 90° F. The annual rainfall amounts to about 100 inches, of which about four-fifths fall in the months from June to November, at the change of the seasons.

The N.E. trade wind sets in from September to October, and blows with varying force by day and night from November to May, when storms are frequent from the East. Prolonged calms usher in the S.W. monsoon in June, which becomes established about the end of July, and is then accompanied by heavy rain and stormy weather, blowing more strongly by day than by night. Typhoons are not uncommon between July and December, sometimes causing great destruction.

Page 1006.—**Tomil Bay** is described, by the officers of the U.S.S. *Supply*, 1905, as easily entered in ordinary weather, the entrance being plainly marked by a *black can* buoy to port, and a *red can* buoy to starboard, in entering. Within the entrance, the salient points of the reefs are marked by beacons, and there are no outlying dangers. In approaching, a conspicuous tree will be seen on *Buray* or *Madade Hill*, which is 472 ft. high; this hill is surmounted by a *beacon* carrying a triangle, and bearing N.W. by N. ⅞ N. forms a good mark to lead to the entrance. *Entrance Rock* is also very conspicuous, being marked by a large *white beacon*, and the government buildings at Blelatsch are visible from sea. There is usually a westerly current setting across the entrance. A pilot will come off when signalled, the charge being 8*s.* per foot of draught in 1905.

The 12-ft. rock, reported to lie half a mile E. ½ S. from Entrance Islet, has been searched for in vain, but a 2¾-fathoms rock was found at half a mile E. by N. from the islet.

In a sailing vessel the best time to enter is between noon and 2 p.m., when the reefs will be more easily seen. The best anchorage is in 22 to 24 fathoms, soft clay, northward of Engnoth, the first islet within the reef. The most convenient anchorage is in the middle of the basin between Engnoth and Obi Islets. There are several good boat landings, the German offices being on *Blelatsch Island*, which is connected with the coast at the old Spanish settlement by a causeway.

Fresh supplies are scarce, only a few pigs and fowls being obtainable. There is a coal store on the S.W. end of *Tarrang Islet*, and fresh water may also be had here.

Pages 1007-1008.—**NGOLI or Matelotas Islands** are six in number, two at the northern angle, two at the southern angle, and two on the western side of the atoll, which is of triangular form, about 20 miles in extent N.E. and S.W., with the apex to the N.E. The northern islet is covered with cocoanut palms, rising 100 ft. above the sea, and the reef extends about 3 miles beyond it. Between the North and South islets the reef is sunken, with 6 to 24 fathoms over it, to within 4 miles of the latter, where it nearly reaches the surface. There are deep but narrow channels on either side of the southern islet, and the German war-vessel *Cormoran* anchored northward of it, but there was no shelter from the sea. The population is very small.

Pages 1008-1011.—**PALAU or PELEW ISLANDS** were ceded by Spain to Germany in 1899, and are under the government administration of the Western Caroline Islands. German officials are stationed on Malakal Island, in Korror Harbour, but vessels entering here must first obtain permission from the officials at Yap, where a native pilot may also be obtained.

Between Angaur Island on the South and Ngaruangl Reef on the North, the group is about 85 miles in extent, being about 16 miles across in its central and widest part. It is said to number about 200 islands, but has not yet been properly surveyed; the chart is stated to be very inaccurate, and must be used with the greatest caution. In 1902, the population was estimated at upwards of 3,700, but the islands at present are of little commercial importance. Coal has been found on the surface in the southern part of Baobeltaob, but of inferior quality, appearing to be a brown variety of recent formation. Earthquakes are occasionally experienced. There appears to be no settled rainy season, heavy rains being frequent at all times of the year.

Page 1011.—**Velasco Reef.**—In 1895, soundings of 4 to 11 fathoms were taken from the Spanish war-vessel *Velasco*, when in about lat. 8° 27¾′ N., long. 134° 42¾′ E., on the eastern edge of a shoal, which appeared to extend about 8 miles northward, some distance southward, and 5 or 6 miles westward from this position. At noon, January 20, 1898, the German barque *Osterbek*, Capt. R. Andersen, was about 6 miles E.N.E. of the northern end of Kajangle Island; steering thence N.N.W. for 26½ miles he passed over an extensive reef in about lat. 8° 30′ N., long. 134° 35′ E., and obtained soundings of 8 fathoms. Continuing his N.N.W. course for about 8 miles, he then ran over a smaller reef with about 8 fathoms.

Kajangle Islets.—The centre of the largest island is now charted in longitude 134° 40′ E. *Good Look-out Islands* are considered not to exist.

Ngaruangl Reef is now charted about 9 miles N.W. ½ W. from the N.W. edge of Kajangle Reef, and may be connected with Velasco Reef.

Kossol Reef.—In 1906, the steamer *Agincourt* was wrecked on a reef lying between Kossol Reef and the reef to the westward.

Pages 1011-1012.—**BAOBELTAOB, or Babelthuap.**—According to the most recent German observations, *Mount Aremolunguj* is in lat. 7° 30½′ N., and *Cape Artingal* in lat. 7° 30½′ N., long. 134° 44½′ E. There are trading and mission stations at *Molegojok*, and here the reef extends but a short distance off. Hence to the north-westward the barrier reef increases in distance to 2 miles off, and extends about 8 miles northward from the North end of the island, off which is a trading station on *Ngarekur Islet*. Westward of this reef is another extensive range of reefs extending northward of the N.W. part of the island, and between these two reefs is a navigable channel named *Kawasak Passage*, leading to Ngarekur and thence to Aremolunguj Passage.

Southward of Cape Artingal the barrier reef reaches 3 miles off, enclosing a lagoon with numerous coral patches between which there are navigable channels.

Augulpolu Reef is another barrier, constantly breaking, extending in a curve off the South end of Baobeltaob to the S.E. part of Korror, from which its outer part is about 5 miles distant; on it, about 2 miles from Korror, is a sandy islet. *Altngot Passage*, the northern entrance to the enclosed lagoon, is about a mile wide, and can be safely approached with the conspicuous rounded islet named *Korak* bearing N.W. ¼ W.

Armijttoakl Passage, between the islands off the South end of Baobeltaob and Korror, is not recommended for vessels drawing over 21 feet, being narrow and very tortuous.

Pages 1012-1013.—**Korror.**—*Kasebogau Passage*, the southern channel into Malakal Harbour, is now marked by beacons on the edges of the reefs. The tidal streams run strongly in it. In 1907, the German war-vessel *Planet* approached it from sea by steering W.N.W. for some whitish gray spots on the shore of Urukthapel, this course leading clear of all reefs.

Malakal or *Malackan Island* is the seat of the German officials, and there are mission and trading stations here. It is high water here, on full and change, at about 7h. 45m.: springs rise 6 to 7 feet. The anchorage eastward of Malakal is not recommended for vessels drawing over 21 feet, and that westward of it is exposed to a heavy sea with westerly winds.

Page 1013.—**Urukthapel.**—Off the S.E. extreme, with a deep channel between, is a reef about 2½ miles in extent with an island on its N.W. end. A reef also extends about 2 miles off the S.E. end of Eil Malk. Between these reefs is a wide passage leading to the channel between the islands, which is said to have 7 to 10 fathoms in it. The South point of Urukthapel is now charted in lat. 7° 14′ N., long. 134° 29½′ E.

Keil Island was reported to lie westward of Urukthapel, in lat. 7° 15′ N., long. 134° E. In 1907, the steamer *Vermont* passed close to the given position, and nothing was seen of it.

Pages 1013-1014.—**Eil Malk.**—The S.E. point is now charted in lat. 7° 10½′ N., long. 134° 29′ E. *Denges Passage* is stated by the natives to be the best and deepest channel into the lagoon.

Page 1014.—**Pililu.**—The N.E. point lies about 11 miles south-westward of Eil Malk, and the chart shows no passage over the reef between it and Denges Passage. The islet close off the South extreme is now charted in lat. 6° 55½′ N., long. 134° 15′ E.

The chart shows a passage close round the north-western side of Pililu into the lagoon, but the western reef appears to extend thence in an unbroken line to Aremolunguj Passage, the channel by which the *Endeavour* passed out in 1793 now being reported closed up.

Aremolunguj Passage is now charted in lat. 7° 31′ N., long. 134° 33½′ E., and is 3 to 4 cables in width. There is a trading station at the foot of Mount Aremolunguj. *Woodin Passage* is stated to be dangerous.

Angaur is separated from the South extreme of Pililu by a channel 3 miles in width, and some patches of reef are charted midway between. Landing is reported to be only possible about the middle of the western side.

Page 1015.—**Anchorite Isles.**—The northern islet is now charted in lat. 0° 53′ S., long. 145° 31′ E. The encircling reef extends about a quarter of a mile off the northern end, and half a mile off the S.W. end of the group.

Page 1016.—*Commerson Islets* lie about 15 miles N.W. by W. from the Anchorite group, the S.W. islet being in about lat. 0° 45′ S., long. 145° 16′ E.

In 1886, the German cruiser *Albatross* passed within 4 miles of the position of the two islets reported to have been seen on the Equator, in long. 146° E., by Capt. Ebury, of the barque *Adventurer*, in 1877; nothing was seen of them. In 1901, however, Capt. H. Sandal, steamer *Willowdene*, reported that he passed a low sandbank in lat. 0° 1′ N., long. 146° E.

On August 7, 1899, Capt. Hemming, of the steamer *Dundee*, saw, at a distance of 1½ mile, what he considered to be a reef, with two rocks on it 16 to 20 ft. high, and 200 to 300 yards apart, in about lat. 0° 11′ S., long. 144° 15′ E., or about 60 miles northward of L'Echiquier Islets. In 1906, they were unsuccessfully searched for by the officers of the German war-vessel *Condor*.

Boudeuse Island is low and wooded, and lies on the eastern side of a reef enclosing a lagoon, with no entrance. It is in about lat. 1° 27′ S., long. 144° 33′ E., and is uninhabited, but the natives of the adjoining groups sometimes visit it.

L'Echiquier Islands have not been examined; from H.M.S. *Espiègle* their N.W. extreme was observed to be in lat. 1° 3′ S., long. 144° 24′ E.

Pages 1016-1017.—**Hermit Islands** are densely wooded, and had 400 or 500 inhabitants, from whom pigs, fowls, fish, and taro may be obtained, and fresh water can be had on the S.W. side of Loof Island. There was a German trading station on Péme Islet. They lie in a region of calms, and the current usually sets strongly westward. The usual anchorage is abreast the village on the North side of Loof Island, in 15 to 25 fathoms, and the space between this and the *N.W. Pass* is apparently clear of reefs.

Alacrity Anchorage is separated from the above anchorage by a barrier of reefs. *Coeran Passage* is about 100 yards wide, with 4 to 5 fathoms in it, separated from Sabben Passage by a reef about 400 yards in extent. At Alacrity Anchorage the tidal stream is felt for about 4 hours after low water.

Page 1017.—**Allison Island** was reported in 1886, by Capt. Allison, of the steamer *Fei-Lung*, as a wooded island, 2 or 3 miles long, N.W. and S.E., and 100 to 150 ft. high, in lat. 1° 25′ S., long. 143° 26′ E.; he passed about midway between it and Durour Island, both islands being visible, and from 6 to 8 miles distant.

Capt. W. I. Miller, steamer *Heathdene*, reported that at 10 *p.m.*, on January 18, 1903, he passed about 4 *miles* from an island about 60 ft. high and 800 *ft.* long, lying in lat. 1° 26′ S., long. 143° 37′ E., or about 12 miles eastward of the given position of Allison Island.

Matty or Hun Island is reported by German officers to lie in lat. 1° 45′ S., long. 142° 47′ E. It is about 5 miles in extent East and West, by 4 miles in width, low, and densely wooded with cocoanut palms, &c.; the natives, numbering 527 in 1906, are a fine race, of light colour, and were friendly when visited by the German cruiser. It has fringing reefs on its West and North sides, not easily seen, with an islet on each, and reefs extend far off the N.W., S.W., and N.E. angles. There is said to be anchorage off its South side.

Durour or Bobolo Island.—In 1905, the officers of the German war-vessel *Moewe* observed the eastern point to lie in lat. 1° 27½′ S., long. 143° 6′ 20″ E. No anchorage could be found around it. In 1906, the population numbered 475.

Tiger Island is considered to be identical with Matty Island; it has been searched for in vain in its reported position.

An interesting account of the islands of Matty and Durour and their inhabitants, illustrated by photographs, by R. Parkinson (who visited them in the *Moewe*, in 1899), will be found in "Globus," Band lxxviii., 1900, pages 69-78. Each island was estimated to have about 2,000 inhabitants, living on cocoanuts, yams, breadfruit, bananas, fish, turtle, &c.; they were hospitable, but a weakly-manned vessel might meet with a different reception.

Pages 1017-1018.—**NEW GUINEA** may rather be considered a continent, than the largest island in the world. It may be said to have been discovered by Don Jorge de Meneses, a Portuguese, who reached its northern extreme in 1526, and the natives were then termed *Papuas*, by the Molucca sailors, on account of their woolly hair. Its North coast was afterwards visited by the Spanish navigators, Alvaro de Saavedra, in 1528 and 1529, who called it *Isla de Oro*, and Ortiz de Retes in 1545, the latter naming it *Nueva Guinea*, the natives reminding him of those on the African Guinea coast.

BRITISH NEW GUINEA is described in the Addenda to Findlay's "Directory for the South Pacific Ocean."

Pages 1017-1021.—**KAISER WILHELMSLAND,** the German portion of New Guinea, is of little commercial importance, and it is therefore quite unnecessary to repeat here the description given on pages 306-320 of the Addenda to Findlay's "Directory for the South Pacific Ocean." The seat of government is at Herbertshöhe, in New Britain, with a subordinate station at Friedrich Wilhelmshafen. The German New Guinea Company has established plantations of rubber, cocoanuts, cotton, tobacco, etc., at the latter place, Stephansort, Konstantinhafen, Erima, Finschhafen, and other places, but hitherto the exports have been limited to small quantities of copra, cotton, tobacco, trepang, tortoise-shell, and pearl-shell, amounting to an annual value of only £10,000 or £12,000. Missionaries are at work among the natives. In 1905, the European residents numbered 128.

Page 1021.—**DUTCH NEW GUINEA** is but little known, and there are no permanent European settlements. A Dutch official is stationed at Manokwari, in Dorei Bay, and missionaries are at work in Geelvink Bay. The coast eastward of the latter bay, including Humboldt Harbour, is described in pages 318-320 of the Addenda for Findlay's "South Pacific Directory," and we now proceed to give the most recent information obtainable as to Dorei, etc., in Geelvink Bay.

Page 1022.—**Point d'Urville** is now charted in lat. 1° 25½′ S., long. 137° 48′ E. The mouth of *Ambernoh* or *Mamberonmo River* is about 3 miles westward of it. Between this and Geelvink Point is the mouth of *Aiberan River*, the muddy water from which reaches far out to sea. This coast is low and marshy.

Stephens Islands were reported by Capt. Carteret, H.M.S. *Swallow*, in 1767, as two low wooded islands, 2 miles apart, and 6 and 3 miles in length respectively, but they have not since been seen. A reconsideration of his report led to their being shifted on the chart to lat. 0° 22′ S., long. 136° 10′ E. In 1898, the Dutch war-vessel *Serdang* made a careful search around the latter position, and nothing could be seen of them. It is thought that Captain Carteret may have mistaken two distant summits of the Schouten or Mysory Islands, considering them to be two islands near at hand.

Page 1023.—**GEELVINK BAY.**—In 1897, breakers were reported to have been seen from the Dutch steamer *Zeemeeuw* in the channel between *Kurudu*, *Atere* or *Quoy Island* and Geelvink Point. On the South side of Kurudu is *Manupu* anchorage, in 6½ fathoms.

Padeaido or *Traitors Islands* are low and wooded. Little is known of *Jobi* or *Geelvink Strait;* anchorage has been found in 20 fathoms near the edge of the reef, on the North side of Jappen Island, in about long. 136° 3′ E. In 1907, the natives reported that a reef extends a considerable distance from Jappen towards Miosini Island.

Wooi Bay, 8 miles south-eastward of *Cape Saribi* (the West extreme of Jappen), is an almost landlocked inlet 2½ to 5 cables in width, the depth gradually decreasing inwards from 27 to 12 fathoms.

Ansus Harbour.—The best anchorage is in 17 fathoms, mud, north-westward of Kambeppi, on the western point of Kaiari.

Musnum, *Bultig*, or *Hump Island* is from 300 to 500 ft. high, and the channel between it and Jappen is said to be safe. *Pono Kabai Islets*, off its eastern end, are five in number, rocky and wooded. Another islet lies off its N.W. extreme and two others at 6 miles westward of it.

Meíur, *Numfur*, or *Long Island* is about 10 miles in diameter, and is said to be 335 ft. high. In 1898, the captain of the German steamer *Stettin* reported a breaking reef extending about 2½ miles off its North side. Another reef extends 5 miles southward from its S.W. side. The only known anchorage is off the eastern side of Manim Islet, lying off its West side.

Page 1024.—**Schouten or Misori Islands.**—*Wiak* or *Biak*, the eastern island, is about 40 miles in extent N.W. and S.E., rising to an elevation of 800 ft. in *Mount Sombunem*, at its N.W. end, the rest of the island being low. There are many villages along its southern side, and, in 1900, the Dutch steamer *Java* anchored about 2 cables off *Mokmer*.

Sornidori Strait, the narrow channel separating Wiak and Supiore Islands, is only navigable for canoes.

Supiore or *Koredo* is about 15 miles in extent, rising to an elevation of 1,600 feet. On its S.W. side is an inlet, in the entrance of which anchorage may be found, but the water is deep; there are some islets and numerous rocks off it. There is said to be good anchorage off *Maudor*, within the islets off the North side of the N.W. point of Supiore.

Mofia, *Aifondi*, or *Providence Islet*, about 13 miles north-westward of Supiore, is inhabited, and about 200 ft. high, with a long reef extending W.S.W. from it. H.M.S. *Basilisk* anchored in 9 fathoms, about 9 miles E. ½ N. from it. *Ysabel Reef*, about 2½ miles southward of it, was reported by Capt. Dallman, in 1889, to be 5 miles in extent E. by S. and W. by N., and 1 to 1½ mile wide, with about 6 to 8 ft. water on it.

Mioskaroar, *Aisawi*, or *Danger Islet*, about 15 miles N.W. of Mofia, is low and wooded, with a wide reef extending about 12 miles N.N.W. of it. The bank of 4¾ fathoms is now charted at 42 miles E.N.E. of Danger Islet, in lat. 0° 2′ S., long. 135° 44′ E.; from it Supiore peak bore South.

PORT DOREI is an inlet a mile in extent, half a mile wide at its entrance, and 2 cables across in its upper part, affording good sheltered anchorage in 10 to 20 fathoms. About half-way up, on its eastern side, is the village of *Manokwari*, in about lat. 0° 52′ S., long. 134° 3¾′ E., the residence of some Dutch officials, with a small pier over the reef for facilitating the landing and shipment of coal, etc.; fresh water may be had from a stream. There is a mission station south-eastward of it.

Geelvink Bay is but little known, and the following few remarks will supplement what is shown on the chart.

About 3 miles south-westward of Port Dorei there is anchorage off *Andai*, in 15 fathoms. Here the coast turns south-eastward and is backed by the *Arfak Mountains*, the highest peak of which attains an elevation of 9,157 feet. *Amberpon Island* is connected with the mainland (on which are three conspicuous red hills) by a reef, and there is anchorage off *Warmafu*, on its N.W. side, in 15 to 30 fathoms.

On the mainland, abreast the southern end of *Meoswar Island*, is the small bay of *Wairur* or *Karuani*, where there is anchorage in about 30 fathoms. Small vessels can anchor in 15 fathoms in *Wendesi Road*, about 12 miles farther southward, within some islets and reefs; there is a mission station here, forming a good landmark. Traces of coal deposits have been found in this vicinity, the hilly isthmus between this and the head of McCluer Gulf being of carboniferous formation.

Wandammen Bay is the large inlet westward of a high peninsula, off the North end of which lies *Ron Island*. *Job Island* lies in the entrance of the bay, and the captain of the steamer *Jeschke* passed westward of it without seeing the reefs shown on the chart. Off the N.W. side of the peninsula are some reefs, within which there is anchorage in *Wandamui Road*, in 12 fathoms or less.

Jendu Road, between Rariee Island and the western point of Ron Island, affords sheltered anchorage in about 20 fathoms.

On the eastern shore of Geelvink Bay, between lat. 1° 20′ and 2° 30′ S., are the mouths of numerous lagoons and the *Rivers Kei* and *Aiberan*. Small craft may pass from the Kei into the Ambernoh River.

Pages 1024-1025.—**MAPIA, Bunai,** *St. David*, or *Freewill Islands* were discovered by the Spanish navigators Hernando de Grijalva and Alvarado in 1537, and by them named *Gueles* or *Geles*. They were also visited by Dampier, in 1705. They were named Freewill by Carteret, one of the natives having voluntarily consented to go away with him. They were claimed by Germany, in connection with the treaty with Spain in 1898, but were decided to belong to Holland, a Dutch official being stationed here. The islands are five in number, situated on a coral atoll about 9 miles in extent North and South, the northern part (4 miles across where widest) enclosing a lagoon into which there appears to be no entrance. *Pegun*, the southernmost island, is 2½ miles long, and fringed by a reef 3 cables to 1 mile in width, its southern point being in lat. 0° 49′ N., long. 134° 17′ E., according to the Dutch survey. *Fanildo Island*, on the northern extreme of the atoll, is not inhabited; about midway between it and the N.E. end of the atoll, there is anchorage in 10 to 12 fathoms, close to the reef. The N.E. island is named *Bras*. In 1900, the inhabitants numbered about 65, engaged in collecting copra and trepang.

Page 1025.—**Cambusdoon Islet** (?).—On the morning of August 21, 1900, Capt. A. N. Saxegaard, of the Norwegian barque *Cambusdoon*, passed about 1½ mile northward of an uncharted islet, about 12 or 15 ft. high and three-quarters of a mile in diameter, lying in lat. 2° 4′ N., long. 135° 35′ E., by trustworthy observations.

Carteret Reef.—The position given depended upon Freewill Islands lying 3° eastward of their present charted position. In 1885, the captain of the U.S. ship *Sooloo* reported having seen breakers in about lat. 2° 40′ N., long. 134° 4′ E.

Pages 1025-1026.—**HELEN REEF** is within the German "sphere of influence." It is considered that the given longitude is open to doubt.

On the night of February 16, 1889, the barque *Transit* struck on a reef (afterwards foundering) stated by Capt. Morlon to be in about lat. 2° 49′ N., long. 132° 30′ E., or about 45 miles eastward of the charted position of Helen Reef. As the given position cannot be relied on, the vessel may possibly have struck on Helen Reef.

Page 1026.—**TOBI, Kodogubi**, or *Lord North Island*, is now under German control, and is considered to be in lat. 3° 2′ N., long. 131° 5′ E. It was discovered by Capt. W. Rogers, in the ship *Duke*, in 1710, and was seen by Carteret in 1767. It is of triangular form, about 1 mile in extent, by half a mile wide, with some cocoanut palms on it, visible when 12 miles distant. There is no anchorage around it, and it is occasionally visited by hurricanes and earthquakes. The natives are about 500 or 600 in number, and now said to be peaceful. A very interesting account of the island and people, by H. Seidel, will be found in the German periodical "Globus," 1904.

MARIERE, Merir, or *Warren Hastings Island*.—Observations by the officers of H.M.S. *Pallas*, in 1894, placed this island in long. 132° 21′ E. In 1906, the Germans removed the inhabitants of this and Anna Island to Palau and Yap Islands, owing to famine, thus leaving them uninhabited.

ANNA, Pul, or *Current Island* is now charted in long. 132° 2′ E.

Page 1027.—**SANSORAL, Sonzerol**, or *St. Andrew Islands* are under German control, and now charted in long. 132° 14′ E. They were visited by the German steamer *Seestern* in 1906, when Capt. C. Moeller found a clear channel about 2⅓ cables wide between them, the northern island being named *Fana* and the other *Songosar*, their extent North and South being about 1¼ mile. There is no anchorage, the fringing reefs being steep-to. The natives stated that the islands had been swept by a hurricane and flood-waves a year or two previously, causing great distress.

Pages 1028-1029.—**CLIPPERTON ISLAND**, lying 670 miles S.W. by W. from Acapulco, belongs to Mexico, and has been leased to the Pacific Islands Co., who work the phosphate. The settlement consists of some buildings on the N.E. part of the reef, off which is the only known anchorage, in 20 to 45 fathoms, not more than 1¼ cable from the edge of the reef, with the flagstaff bearing about S.S.E., and marked by a *spar buoy*. Vessels should always be ready to slip their cables, heavy squalls being prevalent between North and E.N.E. Boat landing is always difficult, owing to the constant surf, and is sometimes impossible for a week at a time. Rain, which is frequent, is depended on for fresh water, which is stored in iron cisterns. Seabirds' eggs are gathered on the rocks in the N.W. part of the lagoon, but fish, though abundant, is not good. The lagoon water is brackish, and has a strong smell of ammonia during the dry season, from November to May.

In 1897, a sketch survey was made of the atoll by Capt. P. J. Hennig, by which it appears to be oval in form, about 2⅔ miles in extent N.W. and S.E., by 1¾ mile in greatest width, with no passage into the lagoon. Some illustrated notes on its interesting geological character are given in the "Quarterly Journal of the Geological Society," 1898, pages 228-233.

Clipperton Rock, at the S.E. end, is a rugged mass of volcanic origin, and 62 ft. high, according to the officers of H.M.S. *Comus*, 1897. The fringing reef of the atoll breaks heavily, and is highest (14 ft.) on its N.W. side; much drift-wood and wreckage is found on it. Depths up to 55 fathoms were found in the lagoon. It is high water, on full and change, at 8h. 40m.; springs rise 4¼ ft., neaps 2⅔ feet.

Light.—In 1906, the Mexican government established a small lighthouse on Clipperton Rock; the light is *bright*, with groups of *four occultations*, elevated 85 ft. above high water, and visible 15 miles.

Currents.—In the vicinity of Clipperton Island the currents are very variable, sometimes setting westward and sometimes eastward, 2½ knots an hour, and often little or no current at all.

Page 1029.—**Oceana Bank.**—Capt. J. Page, ship *Oceana*, reported that on June 3, 1891, having noticed discoloured water, he sounded in 63 fathoms, rocky bottom, in lat. 8° 24′ N., long. 115° 25′ W. About 3 miles eastward of this he found 101 fathoms, and it is possible less than these depths may exist.

This bank may have some connection with a low coral atoll vaguely reported to lie 400 or 500 miles south-westward of Clipperton Island, and which has been unsuccessfully sought for by several expeditions in search of buried treasure.

PASSION ISLAND.—Nothing more is known of this. In 1887, the officers of the U.S.S. *Adams* observed no indication of it in lat. 16° 54′ N., long. 109° 54′ W. It has also been searched for in vain by H.M.S. *Portland* and the U.S.S. *Portsmouth*.

Pages 1030-1032.—**REVILLA GIGEDO ISLANDS** belong to Mexico, which has granted a concession for exploiting their fisheries, minerals, &c. They have hitherto been uninhabited.

SOCORRO.—According to the officers of the U.S.S. *Albatross*, the only good landing place is on a sandy patch in the stony beach of the cove north-eastward of the southern extreme of Cape Rule. *Braithwaite Bay*, north-eastward of this cove, is open to southerly and easterly winds, and the beach at its head consists of rocky ledges and stones, on which the boats of the *Albatross* landed without much trouble in fine weather.

Page 1031.—**San Benedicto Island**.—According to the U.S. survey, the South point is in lat. 19° 17′ 15″ N., long. 110° 49′ 22″ W. There is fairly good anchorage in 15 fathoms, off the small shingle beach on the eastern coast.

Page 1032.—**Clarion Island** is 214 miles from Socorro. On the U.S. survey the three prominent peaks have elevations of 1,110, 933, and 959 ft., respectively. The observation spot is placed in lat. 18° 20′ 55″ N., long. 114° 44′ 17″ W.

Page 1033.—**Roca Coral, Etc.**—In 1899, the U.S.S. *Albatross* traversed the region between lat. 15° and 19° N., long. 132° and 139° W., without finding any traces of these doubtful islands, soundings giving depths of 2,766 to 3,088 fathoms near the position of the island reported in lat. 17° 10′ N., long. 136° W. In 1902, Capt. Lawless, steamer *Australia*, saw indications of shoal water (about 5 to 7 fathoms) in lat. 18° 56′ N., long. 136° 10′ W., and this led the U.S. authorities to despatch the cruiser *Tacoma* on a searching expedition in 1904. Nothing was seen of it, nor of the following, and few birds were seen:—*Sultan Island*, lat. 15½° N., long. 134° W.; *Bunker Island*, lat. 15½°, long. 136°; *Groupe Island*, lat. 16½°, long. 134½°; *Eclipse Island*, lat. 17°, long. 138°; an island or reef in lat. 17° 10′, long. 136°; and *De Greave Island*, in lat. 17° 40′ N., long. 135½°.

In 1899, what appeared to be breakers and a low reef were seen from the U.S.S. *Oregon*, when in lat. 17° 18′ N., long. 136° 35′ W., about 2 miles to the S.W.; on a closer approach they proved to be a school of porpoises.

An interesting article on these reported islands and reefs, by Mr. J. D. Hague, will be found in the U.S. "National Geographic Magazine," December, 1904, pp. 478-489.

Pages 1033-1034.—**JOHNSTON ISLANDS** have been annexed by the United States, but are at present uninhabited, the Guano Co. having abandoned it to the countless seabirds which frequent it for breeding and other purposes. In 1892, they were visited by H.M.S. *Champion*, when a sketch survey was made, the hut on the S.E. point of the larger island being placed in lat. 16° 44′ 48″ N., long. 169° 32′ 24″ W. The atoll reef is about 8 miles in extent N.E. and S.W., its northern side being well marked by breakers, but its southern and eastern sides are not so apparent. The larger island rises to an elevation of 40 ft. at its eastern end, and was covered with long grass, having no trees or bushes. Landing is bad, but at high water small boats can reach the beach near the ruined huts.

Vessels can safely approach by bringing the eastern end of the island to bear N.W. by N.; 7 fathoms will be found when about 5 miles distant, between which and the anchorage are depths of 5½ to 12 fathoms, with patches of shoaler water on both sides of the track. The anchorage is in 6½ fathoms, 8 to 10 cables S.E. by S. from the summit of the island, sheltered from the N.E. trade, but open to winds between East and W.S.W. round by South. It is high water, on full and change, at 3h. 15m., the rise and fall being about 3 feet.

In 1897, Capt. F. Herriman, schooner *Novelty*, reported that he sounded in 5½ fathoms, coral, about 12 miles E.N.E. of the summit of Johnston Island, the bottom being visible for 2 miles North of this position; breakers were observed about 3 miles eastward.*

Pages 1034-1035.—**TAONGI, Gaspar Rico,** or *Smyth Islands* belong to Germany, being considered the northernmost of the Marshall group. They are not inhabited, and are frequented by seabirds, who are said to have formed rich deposits of guano on them. The atoll reef is about 27 miles in extent N.E. and S.W., its southern part being narrow. When visited by the German cruiser *Falke*, in 1896, a boat passage was found through the western reef, into the lagoon, with the middle of Sybilla Island bearing East; a strong current was setting outwards. No anchorage was found.

* In 1893, Capt. J. F. Luttrell, barque *H.W. Almy*, reported he had several times sailed over the charted positions of a shoal in lat. 16° 29′ N., long. 163° 56′ W., and a reef in lat. 10° N., long. 179° 21′ W., and saw no signs of them.

Pages 1035-1036.—**WAKES ISLAND** is considered by Mr. H. B. Guppy to be the *San Francisco* of Gallego, 1568. It was annexed by the United States in 1899, when visited by the U.S.S. *Bennington;* it was found to rise 15 to 20 ft. above the sea in places, with some bushes on it, but is not easily made out from a distance of over 8 or 10 miles. No anchorage could be found around it, but the boats landed on a sandy patch on the N.W. side of the passage into the lagoon, on the S.W. side. A flagstaff was erected here, and observed to be in lat. 19° 17′ 50″ N., long. 166° 31′ 2″ E., the latitude closely agreeing with that of the *Leipzig* in 1883. Observations on the U.S.S. *Kentucky*, in 1904, place it in lat. 19° 17′ N., long. 166° 33′ E.

Page 1036.—**Alligator Shoal** was reported in 1844 to be horseshoe-shaped, 16 miles in extent. The U.S. ships *Oregon*, in 1899, and *Scindia*, in 1900, could find no trace of it. Other U.S. transports have passed near the reported position, and nothing was seen of it.*

Pages 1037-1039.—**MARIANA or LADRONE ISLANDS** still remain of but small commercial importance, but came into prominence when relinquished by their Spanish possessors. Guam was ceded to the United States on the termination of the war in 1898, and the other islands were acquired by Germany in 1899, as already explained in the Addenda for page 970. The U.S. officials are stationed at Agaña (Guam), and the German at Garapan (Saipan); vessels visiting the islands must first enter at these ports.

The total population is now estimated at less than 13,000, of whom about four-fifths reside on Guam; in 1904, the inhabitants of the German islands numbered 2,583, of whom only 10 were European. The only remaining pure Chamorros are said to be on Rota, the present inhabitants being chiefly of mixed descent, Philippine and Caroline islanders and Spanish. The cocoanut is being planted on most of the islands, their export trade being practically confined to copra. Guam and Saipan are visited by steamer from Hong Kong about every four months, the trade among the other islands being carried on by Japanese and other schooners. The ancient remains at Asan (page 1039) have been destroyed.

The northern islands (northward of lat. 16° N.) are of volcanic formation, with but little rock of coral formation, while the southern islands have a surface deposit of coral rock over the volcanic nucleus. Some of the volcanic peaks are still active, and earthquakes are occasionally experienced.

Pages 1039-1041.—**Climate, &c.**—The climate is fairly healthy for Europeans, the temperature being equable, at Guam ranging between recorded extremes of 66° and 90° F. in 1902. Clear weather, with small rainfall, prevails during the N.E. trade season, most rain falling from July to December. Typhoons may occur at any time, but principally from July to November and in April. On November 8, 1905, Saipan and the adjacent islands were visited by a most destructive cyclone, destroying buildings and vegetation, and causing great havoc among the cocoanut groves.

Currents.—In the vicinity of the Marianne Islands, the prevailing surface drift is westward or south-westward, varying from 1 to 2 knots an hour; from July to September, the influence of the S.W. monsoon often reverses this drift to the N.E. On the East coast of Guam, drift timber from the North American coast is found.

For the foregoing and much of the subsequent information we are indebted to German and U.S. authorities, among which we may mention the richly illustrated account of Guam, its people, and productions, by W. E. Safford, published by the Smithsonian Institution in 1905; another account, by L. M. Cox, in the "Bulletin of the American Geographical Society," 1904, pages 385-395; an interesting illustrated article on the islands, &c., by H. L. W. Costenoble, in the German "Globus," vol. 88, 1905; and an illustrated account of a visit to the northern islands by Governor Fritz, 1901, appearing in "Mitteilungen aus den Deutschen Schutzgebieten," vol. 15, 1902, pages 96-118.

Pages 1041-1042.—**GUAM.**—The northern half of this island is a coral limestone plateau 300 to 600 ft. high, above which rise several low volcanic peaks, of which *Mount Santa Rosa*, near the eastern coast, is the highest, 870 feet. Its coast, from Agaña to Pago Harbour, is a succession of vertical cliffs from 350 to 650 ft. high, with some sandy bays on the western coast. The southern half of the island is volcanic and higher than the northern part, a chain of hills extending southward of Agaña,

* In 1893, Capt. J. F Luttrell, barque *H.W. Almy*, reported he had several times passed over the reported positions of the following, and seen no sign of them:—*Bartholomew Island*, in lat. 14° 41′ N., long. 174° 24′ E.; a *reef*, lat. 17° 10′, long. 173° 41′; and a *shoal*, lat. 18° 20′, long 173° 45′.

rising steeply from the western coast, and sloping gradually towards the East, attaining a maximum elevation of 1,290 ft. at *Mount Jumullong Mangloc*, to N.N.E. of Umata. The interior is but little known.

At the census in 1901, the population numbered 9,676, of whom only 30 were white. It is of little commercial importance, but is connected with Yap (see Addenda for page 1095) by telegraph cable; and a *Wireless Telegraph Station* (call letters UK) is established on *Mount Macajna*, southward of Agaña, forming a conspicuous landmark. Some thin layers of iron-ore and deposits of inferior lignite are known to exist, but no other minerals. Wild deer and pigs are numerous, and cattle, horses, goats, &c., are kept. Coffee, cocoa, sugar, and rice are grown, and vessels can usually obtain an abundant supply of tropical fruit and vegetables.

Standard Time in Guam is that of the meridian of 142° 30′ E. or 9½ hours in advance of Greenwich.

In taking soundings in connection with the cable route, a depth of 5,269 fathoms was found by the U.S.S. *Nero* about 72 miles S.E. by E. ¾ E. from the S.E. part of Guam; this abyss is the deepest hitherto found, being only 22 yards short of 6 statute miles. The bottom temperature was 36° F. (See Addenda for pages 1232-1233).

Page 1042.—*Merizo* now has about 500 inhabitants.

Pages 1042-1043.—**Santa Rosa and Galvez Shoals.**—In 1903, the U.S.S. *Supply* sounded over the area between lat. 12° 27′ and 13° 15′ N., long. 144° and 144° 39′ E., and found very irregular depths, 1,926 fathoms being found near the reported position of Santa Rosa Reef. On one occasion a shoal of fish was mistaken for breakers. Between lat. 12° 43′ and 13° 6′, long. 144° 16′ and 144° 38′ E., numerous shoal spots were found, upon some of which a ship might strike, and this region should be avoided. A depth of 12 fathoms, and apparently less water near, was found about 26 miles to S.W. by S. from Cocos Island. The chart will show other details.

In 1899, the local pilot stated that Galvez Bank lies about 10 miles south-westward of Ajayan Point, and breaks in rough weather.

Page 1043.—**Umata Bay** is sometimes difficult to enter with easterly winds, and violent squalls descend from the hills. The village has about 200 inhabitants.

Page 1044.—*Agat* now has about 850 inhabitants, and is connected with Sumay, Apra, and Agaña by road.

Pages 1044-1045.—**PORT SAN LUIS d' APRA** has been renamed *Apra Harbour* by the U.S. authorities, who propose to make it a naval base and coaling station. A scheme was proposed to shelter the anchorage from the continual swell by the construction of a breakwater on Catalan Bank, but this was not proceeded with. The proposal approved was to dredge a 30-ft. channel past Fort Santa Cruz, and enlarge and deepen the inner basin, making Sumay the official headquarters in place of Agaña. This work has not yet been commenced, but boat channels have been cut through the reef to the villages of *Piti*, *Sumay*, and *Apra*, rendering landing much more easy than formerly. Sumay now has about 900 inhabitants.

The navigation has been simplified by the establishment of buoys at the entrance and on the inner scattered reefs, and by leading beacons, as shown on the plan. A pilot can be obtained by signalling off Piti or Agaña, and these places are connected by a good road 6 miles long. Supplies of poultry, fruit, and vegetables may be had at Sumay, Apra, and Piti, but the well water is unwholesome. *Fort Santa Cruz* is now considered to be in lat. 13° 26′ 22″ N., long. 144° 39′ 21″ E.

The entrance is about 2 cables in width between Oroté Island and the extremity of Catalan Bank, and is marked by a *black* buoy on the North and a *red* buoy on the South, whence the course can be shaped for the inner anchorage off Fort Santa Cruz, or the outer anchorage in the N.E. part of the harbour, where *white* mooring buoys have been placed for U.S. naval vessels.

In 1904, the cable steamer *Scotia* was lost on Catalan Bank, at about a cable north-eastward of Spanish Rock, the wreck forming a conspicuous object.

The direction of the *telegraph cable* is marked by two *beacon* posts on the reefs northward of Fort Santa Cruz, in line bearing S. 83° E., and vessels must not anchor southward of this line.

Tides.—On the days of full and change it is high water about 7h. after the moon's meridian passage; the usual rise is from 3 to 4 feet. The set of the tidal streams is irregular, but outside the harbour the current usually sets south-westward; in 1900, however, the Austrian steamer *Siam* encountered a strong northerly current in leaving the harbour. In 1904, also, the U.S.S. *Kentucky* experienced strong tidal currents near Oroté Point, the flood setting northward and the ebb southward.

Directions.—The entrance of Port Apra may be approached by bringing two *white*

beacons in line bearing about E. by S. $\frac{1}{8}$ S.; the front beacon is on the North side of Fort Santa Cruz, and the rear beacon on the mainland, 1,950 yards distant, but with the sun behind them they are difficult to make out. For running into the harbour bring *Mount Reconnaissance* to bear E. $\frac{3}{4}$ S., and steer on so till the West end of Cabra or Apapa Island bears N.E., when steer for it to the outer anchorage. Mount Reconnaissance is not easily made out by strangers; it is the highest peak in the middle of the range, and there is a decided drop in the height southward of *Mount Tinkio*, the southernmost peak. *Oroté Point* is a bluff promontory of dark brown rock.

Page 1046.—**AGANA** had 6,832 inhabitants in 1901, and remains the seat of government. Beef, pigs, poultry, fruit, and vegetables may be had here, and a hospital is maintained. Anchorage is only possible with winds between E.N.E. and South, round by East, and even then is dangerous, on account of the depth and swell.

Page 1047.—**Point Ritidian** is in lat. 13° 38′ 54″ N.

There is a path across the island from *Pago Harbour* to Agaña.

Ynarajan now has about 550 inhabitants.

Pages 1047-1048.—**ROTA** had 424 inhabitants in 1905, and they keep cattle and pigs. It rises to an elevation of about 1,000 ft., sloping gradually to the North, but steeply elsewhere, the coast being cliffy and faced by reefs, which can only be safely crossed by the native canoes. It is of coral limestone formation. An interesting illustrated account of a visit by Governor Fritz is given in the "Mitteilungen aus den Deutschen Schutzgebieten," 1901, pages 194-204.

Capt. von Burski, German war-vessel *Cormoran*, states that a good mark is a white patch on the cliff on the eastern side of *Sosanjaya Bay*, which can be steered for till abreast Taipingon Point to port, when the course can be altered towards an iron-roofed stone building rising above the other houses. The anchorage is in 13 to 16 fathoms, about 2½ cables off shore, and 6 cables S.E. of the stone building, sheltered from the prevailing north-easterly wind and swell. Northward of this is a narrow passage through the reef, which was used by the boats, except at low tide. (*Der Pilote*, 1903, Heft 15, page 392.)

Page 1049.—**Aguijan** lies about 42 miles N. by E. ½ E. from the N.E. end of Rota, its centre being placed in lat. 14° 51′ N.

Pages 1049-1052.—**Tinian** had only 48 inhabitants in 1905, chiefly occupied in preparing dried beef for the other islands. They are dependent on rain for drinking water, the well water being brackish. In January, 1902, observations on the *Cormoran* placed the N.W. point 3 miles westward of its charted position.

The channel between Tinian and Saipan is about 4 miles in width, and was used by the *Cormoran*, no dangers being visible in the fairway.

Page 1052.—**SAIPAN** had 1,788 inhabitants in 1905, and is important as having the German port of entry for the Marianas at Garapan. Its extinct volcanic peak, named *Tapochao*, rises to an elevation of about 1,500 ft., but the other hills do not exceed 600 or 700 feet. There is very little fresh water on the island, the well water being brackish. Rice and maize are grown, and cattle, pigs, and fowls are plentiful.

Pages 1052-1053.—**Garapan.**—The roadstead is subject to a heavy swell when the N.E. trade blows strongly. In August, 1900, the German steamer *München* anchored in 13 fathoms, 1½ mile westward of Garapan, with Mañagasa bearing N.N.E.; the westerly swell caused the vessel to roll heavily. A patch, with only 4½ ft. over it, lies 3½ miles S. 15° W. from the N.W. point of Mañagasa, and is difficult to distinguish; about 3 cables southward of it is another patch of 6½ ft., marked by a pole beacon, on which a *bright* lantern *light* is placed when required.

Page 1053.—**Tanapag Harbour** is accessible to vessels drawing up to 20 feet, but is not recommended to those over 10 feet. There is a stream of fresh water here.

Magicienne Bay is stated to afford good anchorage for large vessels, sheltered from all winds but those between East and South. There is no village here.

Page 1054.—**Esmeralda Bank.**—In 1890, the captain of the schooner *Esmeralda* reported the existence of a bank about 2 miles in diameter, 18 miles westward of Tinian, in lat. 15° 2′ N.; a depth of 25 fathoms was found on its edge. In 1904, the captain of the U.S. schooner *Dolores* reported it to lie 5 miles farther south-westward, stating he had found a least depth of only 12 ft. on it.

FARALLON de MEDINILLA is about 43 miles N. by E. ¼ E. from the N.E. point of Saipan, and rises steeply to an elevation of about 100 ft., its flat summit being covered with low shrubs. Cocoanuts, &c., were planted on it in 1901, when it was uninhabited.

Pages 1055-1058.—In 1905 the population of Sariguan, Anataxan, Alamagan, Pagan,

and Agrigan only numbered 149. The four latter islands are leased to a Japanese copra company.

Page 1055.— **ANATAXAN** has a few inhabitants engaged in making copra. The two peaks are from 2,300 to 2,600 ft. high, with a plain between them. The only convenient landing is on the western side, and is not safe in a heavy sea.

SARIGUAN lies 20 miles N. by E. ½ E. from Anataxan, in about lat. 16° 40′ N., long. 145° 46′ E., and is used as a penal settlement; in 1905, there were only 9 people here. It rises to an elevation of about 330 ft., and there is anchorage for small vessels off its S.W. side, where boats can land below a hut.

Pages 1055-1056.—**FARALLON de TORRES, or Zealandia Rocks**, about 11 miles N. by E. ⅓ E. from Sariguan, were not seen from the Japanese schooner *Tora Maru*, in 1901.

Pages 1056-1057.—**GUGUAN** is charted 36 miles N. by E. from Sariguan, in long. 145° 54′ E., though observations on the German war-vessel *Condor*, in 1906, place it in lat. 17° 18′ 50″ N., long. 145° 50′ E. It is about 180 ft. high, uninhabited, and in 1883 its volcano was reported to be active.

Page 1057.—**ALAMAGAN** is placed by the *Condor* in long. 145° 48′ 6″ E. There is a small village on its South side, where copra is made.

PAGAN lies about 27 miles N. by W. ½ W. from Alamagan, its N.E. end being placed in lat. 18° 11′ N., long. 145° 49½′ E. It is about 11 miles in extent, and has a few inhabitants engaged in making copra.

Page 1058.—**AGRIGAN** rises to an elevation of about 2,450 ft., and large vessels can anchor 2½ to 5 cables off the beach on its S.W. side, where there is a village where copra is made.

Page 1059.—**ASUNCION or Assongsong** rises to an elevation of 3,120 ft., its active volcanic peak being the highest of the Marianas. Cocoanut palms abound, and very large land-crabs are plentiful. There is a small village on the S.W. side, where boats can land. Off the South side is a coral bank of 16 to 20 fathoms, on which vessels may anchor.

MAUG ISLANDS (formerly wrongly named *Urracas*) lie 16 miles N.W. by N. ½ N. from Asuncion, and are now charted in latitude 20° N. On their summits are some rocky columns, from which the Spaniards named them *Las Monjas*; the eastern island is 698 ft. high. They enclose a deep and spacious harbour about a mile in diameter, with entrances from the N.E. and S.W. The channel between the eastern and western islands is 4 cables wide, with a depth of 21 fathoms; that between the northern and eastern islands is 55 yards wide and 5 fathoms deep. Boats can land near a hut on the eastern island. Observations on the *Condor*, in 1906, place the southern channel in lat. 19° 59′ N., long. 145° 13′ 24″ E.

Pages 1059-1060.—**FARALLON de PAJAROS, or URRACAS**, about 41 miles N.W. ½ N. from Maug, is now charted in lat. 20° 33′ N., long. 144° 54′ E. Its volcano remains active, and there are no inhabitants.

Page 1060.—**Beatrice Reef.**—In 1888, Capt. H. F. Williams, schooner *Beatrice*, reported that, in lat. 16° 32′ N., long. 143° 14′ E., he saw a reef 1½ mile in extent East and West, with apparently about 4 fathoms where the vessel nearly ran over it. There are earlier reports of a reef in lat. 16° 32′ N., long. 143° 22′ E. (see page 1061).

Page 1061.—**Dugay Trouin Reef.**—In 1901, the brigantine *Pitcairn* and the U.S. vessel *Grant* both passed the vicinity of this reported danger, and no sign of it could be seen.*

Pages 1062-1065.—**The SANDWICH ISLANDS** were annexed by the United States in 1898, together with the chain of small isolated islands to the westward as far as Ocean or Curé Island, being now admitted to the Union as the *Territory of Hawaii*, the governor residing at Honolulu. Much of the subsequent general information is

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* *San Francisco Xavier Shoal*, reported in lat. 17° 12′ N., long. 131° 30′ E., is considered not to exist by Capt. Duncan, missionary steamer *Morning Star*.

Anson Islands, lat. 13° N., long. 141° 35′ E.—In 1899 and 1900, the U.S. vessels *Yosemite* and *Solace* passed the given position, without anything being seen; and in February, 1908, a thorough but unsuccessful search (lasting 3 days) was made by the officers of the U.S.S. *Supply* in and around the reported position. From these and other reports, they are considered not to exist.

Garbanzos Islands, reported to be in lat. 13° 15′ N., long. 138° 5′ E., were not seen from the U.S.S. *Manila* in 1902.

derived from the Annual Reports of the governor, and the U.S. Hydrographic Office Sailing Directions.

The area of the Sandwich Islands is now estimated at 6,454 square miles, and at the census in 1900 the population numbered 154,001, of whom 90,780 were of foreign origin, including 61,111 Japanese and 15,765 Portuguese, the Chinese now being excluded. In 1906, it was considered to have increased to about 200,000. At the census of 1900 they were distributed as follows:—

Hawaii.....	Area 4,015 sq. m....	Natives 17,609...	Foreigners 29,234...	Total 46,843
Maui..... ,,	728 ,,	... ,,	10,225... ,,	15,191... ,,	25,416
Lanai ..... ,,	139 ,,				
Oahu ..... ,,	598 ,,	... ,,	27,150... ,,	31,354... ,,	58,504
Molokai ... ,,	261 ,,	... ,,	1,975... ,,	529... ,,	2,504
Kauai ..... ,,	547 ,,	... ,,	6,093... ,,	14,469... ,,	20,562
Niihau..... ,,	97 ,,	... ,,	169... ,,	3... ,,	172
Kahulaue... ,,	69 ,,	... ,,	0... ,,	0... ,,	0
Total Area 6,454 sq. m. ...		Natives 63,221...	Foreigners 90,780	Total 154,001

Pages 1065-1066.—The trade of the islands is practically confined to that with the United States, the principal product and export being sugar, chiefly grown in the island of Hawaii, and the remainder in Oahu, Maui, and Kauai, with the aid of Japanese and Portuguese labour. Coffee, of fine quality, and rice are also grown and exported. There are no known minerals and timber is scarce. The islands are free from reptiles, but the mosquito is very troublesome.

During the year ending June, 1907, the value of the exports amounted to £5,860,224, including 359,039 tons of raw sugar valued at £5,372,000, the remainder being made up of coffee, rice, fruit and nuts, hides, wool, honey, etc. The imports were valued at £3,655,217. The vessels entering numbered 428, with a tonnage of 1,049,836.

The trade among the islands is carried on by a daily service of small steamers with Honolulu and Hilo, with which there is regular steamer communication from San Francisco and other ports of the Pacific. Honolulu is connected with San Francisco by a submarine telegraph cable, and since 1902 by Marconi *wireless* telegraphy with Maui, Lanai, Molokai, and Hawaii. There is also a telephone service on Oahu, Hawaii, and Maui, and railways have been constructed on these three islands, with a combined length of about 150 miles in 1907. The *Standard Time* in use among the islands is that of the meridian of 157° 30′ W., noon being equivalent to 10h. 30m., p.m., G.M.T.

Supplies of various kinds can be obtained at the principal places, including cattle, sheep, fowls, etc., and coal (chiefly Australian) in large quantities at Honolulu. Reliable pilots may be had, and strangers are recommended to have one.

Pages 1066-1068.—The climate is equable, the recorded shade temperature having ranged between 50° and 90° F. at Honolulu. The annual rainfall varies greatly, according to locality, from a few inches upward; 41⅓ inches are recorded as having once fallen at Laupahoehoe (Hilo) in the space of 28 hours, and here the annual fall is from 100 to 200 inches. Snow covers the summits of the highest mountains in the winter.

Cyclones are not experienced among the Sandwich Islands, the force of the wind rarely rising above No. 6 of the Beaufort Scale.

Pages 1069-1070.—The volcanic energy in Hawaii remains unabated, but there have been no dangerous eruptions in recent years. In January, 1907, however, the main crater of Mauna Loa was specially active, the lava flowing down to the coast. Those interested in this subject should refer to an illustrated paper by Capt. C. E. Dutton, in the "Fourth Annual Report of the U.S. Geological Survey," pages 81-219; also to illustrated articles by J. D. Dana, in the "American Journal of Science," 1887-9.

Page 1071.—Deposits of coral limestone, etc., have been found at considerable depths from the surface. In a deep boring near the foot of Diamond Head solid lava was first met with at a depth of 1,178 ft. and continued till work was stopped at 1,500 ft.; the water was very salt.

Uniform Buoyage, &c.—Where buoys are used in the ports of the Hawaiian islands, they are arranged on the uniform system in use in ports of the United States (see Addenda for page 204).

Several lights, hereafter described, are maintained to assist navigation by night, and, in addition, small lights are shown at numerous places when the local steamers are expected. Several other small lights are proposed.

Page 1071.—**HAWAII** now has about 50 miles of railway, running from Hilo to Puna, and from Mahukona to Niulii. It is ultimately intended to connect Hilo and Mahukona by a line running along the northern coast. There are *wireless telegraph* stations at Hilo and Mahukona, and telephone communication between the principal places. In the Kohala and Hamakua districts the sugar plantations are being extended by the construction of canals for irrigation.

Page 1072.—**Mauna Kea and Mauna Hualalai** have not been in eruption for many years.

Pages 1073-1074.—**HILO** is of increasing commercial importance, and it is proposed shortly to commence the construction of a breakwater to shelter the anchorage. The usual landing place is at Waiakea, where boats can land in any weather. The Protestant church spire is not easily made out, and the two towers of the Roman Catholic church are light grey. The native church, in the rear of the former, has a large square yellow tower. Supplies of provisions, &c., including fresh beef, can be obtained here, and sometimes coal in small quantities. The railway is described in the Addenda for page 1071.

Halai Beacon is a white pyramid on the summit of Green Hill, behind the town, but it is reported to be partly obscured by a tree. Bearing S.S.W., it leads in westward of Blonde Reef.

Page 1074.—*Waiakea*, formerly *Whyeatea*, has two piers, and vessels drawing up to 15 feet can lie alongside the northern one. The creek water is not wholesome. A small *red electric light* is shown from a pole near the boat wharf, and is visible 3 to 5 miles; bearing S.E. by S. it leads westward of Blonde Reef.

Mbukuola or *Cocoanut Island* has several small buildings on it, and is used for quarantine purposes. A *conical buoy* lies in 6¼ fathoms, off the North end of the reef extending northward from it.

Blonde Reef has a *black whistle-buoy* lying in about 5 fathoms off its N.W. edge; a *black can buoy* off the S.W. side; and a *can buoy* in 7 fathoms, off its southern edge.

The *red light* on the wharf at Hilo is shown from a shed at 20 feet above high water, and is visible 3 miles.

At two-thirds of a mile N.N.W. of Waterfall Creek is *Aleales Point*, on which stands a large sugar-mill. Close off it lies *Turret Rock*, about 15 ft. high, on which are the sugar stores and wharf. There are some small mooring and warping buoys off it.

Honolu or *Cocoanut Cove* (pages 1075 and 1077) is not easily recognisable.

Paukaa Light, 3½ cables northward of Honolu Cove, is shown from a white mast above a small white house, at 155 feet above high water, and visible 5 miles. It is in lat. 19° 45′ 54″ N., long. 155° 5′ 31″ W.

Directions.—In approaching Hilo, the yellow tower of the native church seen between the two towers of the Roman Catholic church, and bearing S. ¾ W., is a good mark for clearing the western side of Blonde Reef. The anchorage in 4 to 5 fathoms is westward (not eastward) of Cocoanut Island.

Tides.—It is high water, on full and change, at 3h. 9m.; springs rise 2¼ ft., neaps 1¾ foot.

In approaching Hilo from the East, a current is usually experienced setting to the N.N.W., at about a knot an hour, for which vessels trading here regularly make an allowance.

Page 1077.—**The Coast** northward and north-westward of Hilo has numerous sugar and other plantations along it, but no shelter or anchorage. A *fixed red light* is shown on *Pepeekeo Point*, about 10 miles northward of Paukaa light, and a *fixed bright light* near *Laupahuhu*, 12½ miles farther north-westward.

Kauhola or Kohola Point Lighthouse, about 12½ miles eastward of Upolu Point, is a white framework tower, showing a *fixed bright* light at 65 ft. above the sea, visible 10 miles. Close south-eastward is the small reef harbour of *Keokea*, near *Niulii*.

Mahukona, about 5 miles southward of Upolu Point, has open anchorage about 2½ cables off it, in 10 to 12 fathoms, coral and sand, and strong off-shore gusts may drive vessels off the steep bank. The best anchorage is said to be off *Makaohule Point*, which is 2½ cables north-westward of the village, but this is farther from the landing. There is a small pier in the creek at its head, where the coasters are loaded, and warping buoys are placed in the anchorage off it. At 1½ cable north-westward of the village is a *white* stone *beacon* about 20 ft. high, and at 1¼ cable south-westward of the village is another *white beacon* about 15 ft. high, near which is a mast on which a *fixed bright light* is shown at 64 ft. above the sea, visible 9 miles. Leading lights are also shown at the wharf when a vessel is expected.

Kawaihae Bay is about 7 miles in width, the village being about 9 miles south-eastward of Mahukona. The best anchorage is in 8 or 9 fathoms, 4 cables westward of the lighthouse, and the bank is very steep-to; within this the bottom is very uneven. From the *Fantome's* berth the Morai bore S.E. by E. $\frac{3}{4}$ E. (page 1079). With strong westerly winds the anchorage is very unsafe; and in calm weather the swell seldom breaks on the projecting reef. Landing is easy by the boat passage, round the northern side of the reef. Fresh beef, fish, and potatoes may be had here, but water cannot be depended on.

Light.—The lighthouse is a white framework tower, now showing a *fixed red* light at 60 feet above the sea.

Page 1080.—**Keahole** or *Kalaua Point*, 23 miles south-westward of Kawaihae, is the western point of Hawaii, and on it stands a mast from which a *fixed bright light* is shown at 49 ft. above the sea, visible 10 miles. *Mauna Hualalai* is 8,275 ft. high.

Pages 1080-1081.—**Kailua Bay.**—The village is about 6 miles south-eastward of Keahole Point, and is now placed in lat. 19° 38′ 40″ N., long. 155° 59′ 30″ W. The shore bank is steep-to, the depth of 10 fathoms being found from $1\frac{1}{2}$ to 3 cables off shore. A *fixed red* lantern *light* is shown on a mast on the low point on the north-western side of the bay.

Keahuhu Bay, 5 miles southward of Kailua, is a creek with precarious anchorage close off the reef.

Pages 1082-1083.—*Kealakekua Bay*, 10 miles S.E. by S. $\frac{1}{2}$ S. from Kailua, is about $1\frac{3}{4}$ mile in width between Lava and Keei or Cocoanut Points, bearing N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E., and extends about a mile within this line. In the outer part the water is very deep, decreasing to depths of 20 to 50 fathoms between Cook and Keei Points; within this it rapidly lessens to 20 fathoms and under. The bay is easy of access, but the anchorage is inferior, with foul bottom.

Kaawoloa, in the N.W. angle of the bay, has a pier landing for boats southward of *Cook's Monument*, which is a conspicuous white obelisk 26 ft. high. There is good anchorage in 10 to 15 fathoms, less than $2\frac{1}{2}$ cables off shore, with the monument N.W. by W., and the South end of the cliff N.E. The road to Kona is in bad order.

Kealakekua, in the eastern angle of the bay, is the usual landing, and hence there is a good road inland to the coffee plantations and the winter resort of *Kona*. Fresh provisions may be had here, but not in large quantities without previous notice. A *fixed white* lantern *light* is shown from a mast on Cook Point.

Sailing vessels bound here are advised to make the land to the southward, on account of the usual northerly drift along this coast. The centre of the pali or cliff bearing N.N.E. leads into the bay, and when close in the church above Napupu forms a good mark. The domed summit of Mauna Loa is not a good landmark for the bay.

Page 1085.—**Ka Lae Point** is a low lava projection surrounded by a reef. Near its extremity is a mast, on which a *fixed bright* lantern *light* is shown at 75 ft. above the sea, visible 8 or 10 miles. The U.S. officials give its position as lat. 18° 56′ 35″ N., long. 155° 41′ 3″ W.

Kaalualu Bay, 5 miles north-eastward of Ka Lae Point, is exposed to southerly winds, but affords good shelter from the N.E. trade. H.M.S. *Sappho* lay here in 10 fathoms, sand and lava, with the extreme of the eastern point bearing E. by N. At $7\frac{1}{2}$ miles farther on is *Honuapo*, with a large sugar-mill; landing is often impossible here.

Punaluu, $3\frac{1}{2}$ miles north-eastward of Honuapo, has exposed anchorage off it in 15 fathoms, only possible in fine weather: there are two mooring buoys for the coasting steamers. Much sugar is made in this district. Two small *bright lights* are shown here when a vessel is expected, to lead to the mooring buoys.

North-eastward of this the S.E. coast of Hawaii has no place of commercial interest. Sailing vessels beating to windward, against the prevailing N.E. trade, are recommended to keep within 20 or 25 miles of the coast, to avoid the strength of the south-westerly current, which may run $1\frac{1}{2}$ knot an hour farther off.

Page 1085.—**Alenuihaha Channel** is 26 miles wide and clear of danger, but sailing vessels will find its navigation much affected by the strong westerly current during the N.E. trade. If bound eastward from the western side of Maui, they are recommended to pass South of Hawaii.

Pages 1085-1086.—**MAUI** now produces large quantities of sugar, mostly by means of irrigation, for which extensive hydraulic works have been constructed. There is a railway $10\frac{1}{2}$ miles in length from Wailuku (Kahului) to Paiea, and another from Lahaina to Kaanapali. There is a *wireless telegraph* station at Lahaina, and telephone communication between the principal places. *Mauna Ika*, the summit of the western peninsula, is now considered to be 5,788 ft. high.

Kanahena Point is the S.W. extreme of the eastern peninsula. A *fixed bright light* is shown on it at 50 ft. above the sea, visible 10 miles.

The South and S.E. coast of Maui affords no anchorage off it, and is densely wooded. The sunken 8-ft. rock lies 7 or 8 cables from *Alau Islet*.

Page 1087.—**Kapueokahi** or *Hana Bay*, immediately northward of Kauiki Head, is only $3\frac{1}{2}$ cables wide, but affords convenient sheltered anchorage in 9 fathoms and under. To enter, pass northward of the *Twins* and other rocks off Kauiki Head. There is good anchorage in 4 to 5 fathoms, in the southern part of the bay, but only a cable in width between the reefs. There are some large sugar plantations in the vicinity.

A *fixed red* lantern *light* is shown on a mast on *Puu Kii Islet*, close northward of Kauiki Head.

Vessels bound here from the West are advised to pass northward of Maui, as the N.E. trade and strong current often make it very difficult to round the S.E. point.

Kahului Harbour is in the angle on the northern side of the isthmus, and has attained considerable importance as a port for the export of sugar, being the only place in the islands besides Honolulu and Hilo where large vessels can load. There are several mooring buoys in the anchorage, in depths from $2\frac{1}{2}$ to 7 fathoms, sand; in 1903, the beacons on the eastern reef were reported not to exist. The tidal rise is only about $2\frac{1}{4}$ feet. Small repairs to machinery can be executed here, and coal and petroleum can be obtained. Fresh water, meat, and vegetables are also plentiful, but ship stores are scarce.

A *can buoy* lies in 7 fathoms on the eastern side of the entrance, and a *nun buoy* in $5\frac{1}{3}$ fathoms on the western side. On the beach stands a conical wooden *beacon* 30 ft. high, surmounted by a *diamond* topmark painted *red* and *white*; at 416 yards S.W. of this is a similar beacon. *Leading lights* are also shown, but no particulars have yet been published.

The ship *J. C. Glade* lay at anchor here from March 2—17, 1897, and Capt. J. H. Stege describes his experiences in the "Annalen der Hydrographie," November, 1897, pp. 469—471. He states that in approaching from the East, the iron chimneys at *Spreckelsville* ($4\frac{1}{2}$ miles eastward of Kahului) form a good mark; hence keep at least 3 miles off shore till abreast Kahului, when a pilot will come off in a whaleboat on being signalled. If the moorings are all occupied, signals will be made for the vessel to stand off and on. The anchorage is safe in summer, but from December to April it is rendered insecure by S.W. storms (Konas). The sugar is hauled off in large lighters by a small tug. Fresh water was scarce.

Kahului will be recognised by the railway station buildings, two large red petroleum tanks, and two high flagstaffs. Some miles inland, behind the town, is a large sugar factory, with two high black chimneys, also forming a good landmark.

A *fixed white* lantern *light* is shown from a mast on *Nakalele Point*, the N.W. extreme of Maui.

Kaanapali Anchorage.—At the western extreme of Maui is *Black* or *Kekaa Rock* situated on the low plain at the foot of the hills. On its North side is the railway wharf, at a cable westward of which is a mooring buoy in 6 fathoms; others lie 1 to $1\frac{3}{3}$ cables farther off to the north-westward, in 14 to 16 fathoms, sand.

Pages 1087-1088.—**Lahaina** has much diminished in commercial importance since the decline of the whale fishery, but exports considerable quantities of sugar. The fort has been demolished, and its site is now occupied by Government House, considered to be in lat. 20° 52′ 29″ N., long. 156° 40′ 38″ W. *Lahainaluna* seminary is now obscured by trees. Fresh beef and fruit may be had, but other supplies and fresh water are scarce.

Light.—The lighthouse is a white frame tower 5ℰ ft. high, showing a *fixed* light at 60 ft. above the sea; *red* (visible 7 miles) between N. 48° W. and West; *bright* (visible 12 miles) over the anchorage and boat channel between West and S. 20° W.; and *red* thence to S. 36° E.

A *nun buoy*, *black* and *white stripes*, lies in about 10 fathoms, $4\frac{1}{2}$ cables S.W. of the lighthouse, and large vessels anchoring usually lie farther out. Others may lie farther in, in not less than 5 fathoms.

Pages 1088-1089.—**Kamalalaea Bay.**—The village on the western side is named *Maalaea*, and the edge of the reef off it is marked by a *cask buoy*. Sugar, maize, wheat, etc., are grown in the vicinity of the bay, and fresh supplies may be had.

A small *fixed red light* is shown on a mast at 75 ft. above the sea, on *McGregor Point*, the western point of the bay.

On the N.E. side of the bay is the village of *Kihei*, with a landing pier, at 2 to 4 cables off which are mooring buoys in 4 to 6 fathoms. At its northern end is a white

oil-tank, northward of which is a high chimney. At three-quarters of a mile south-westward of Kihei is a detached coral bank of 3 to 5 fathoms, with irregular soundings of 6 to 15 fathoms around. At 1½ mile southward of the village the reef extends more than half a mile off shore. The marks of the *Peterel's* anchorage do not apply to Kihei, and the landing pier and buoy mentioned apparently no longer exist.

Pages 1089-1090.—**Makena.**—It is doubtful if the mooring buoys still exist, and recent charts show that the given bearing of Kahulaui from the anchorage is incorrect. *Puu Olai*, or *Round Hill*, is 355 ft. high. The tidal rise is from 2½ to 3 feet.

Page 1090.—**MOLOKINI,** 2½ miles W.S.W. of Makena, is 160 ft. high, and a reef extends 2 cables off the N.W. extreme, near which is the only landing.

KAHULAUI should be spelt *Kahoolawe*, each '*o*' being sounded separately. Its N.E. point lies 6 miles W.S.W. of Kanahena Point (page 1085). The island is about 11½ miles in length, and rises to a height of 1,497 ft. at its North end.

LANAI.—There is a *wireless telegraph* station at *Keeaumoku*. Sailing vessels should not approach the southern shore, or they may be becalmed for days together.

Page 1091.—**MOLOKAI** culminates at its western end in the round-topped hill *Mauna Loa*, 1,382 ft. high, which descends eastward to a plain, cultivated for sugar, etc. *Kamakou*, the summit of the eastern range, is 4,958 ft. high. There is a *wireless telegraph* station at Ka Laau, the western point of the island.

Kaunakakai Harbour is an indentation in the coral reef, 3 cables in extent to N.N.E. by a cable in width. A tramway jetty extends over the flats of mud and sand, the wharf at its end having 12 to 21 ft. water alongside, bottom of soft mud. The outer anchorage is in 7 to 9 fathoms, and is marked by a *nun buoy*, *black* and *white stripes*, in 7 fathoms, about 2 cables off the harbour entrance, with the leading lights in line. Within this buoy the water deepens to 15 fathoms, and then decreases gradually into the harbour, the edge of the reef being marked by *black buoys* on the western side and *red buoys* on the East. The outer leading light is *bright* and the inner *red;* in line they bear N.E. by N. ¾ N., and are visible about 2½ miles.

Kamalo Harbour, 5 miles eastward of Kaunakakai, consists of two narrow breaks in the reef, with depths up to 7 fathoms, but fronted by a bar with 10 to 15 feet water over it. There are sugar plantations in the vicinity.

A *red bell-buoy* lies in 6¾ fathoms off the edge of the reef extending from *Kamalo Head*, the southern point of Molokai, at 1½ mile E.S.E. of Puu Kole Island.

Pukoo Harbour, 8 miles eastward of Kamalo, is another small break in the reef, with depths up to 5 fathoms in it, and it is proposed to construct a jetty over the shore flats. When a vessel is expected, *two* small *bright* leading *lights* are shown on posts; in line bearing N.W. ¼ N. they lead into the harbour, between the breakers.

Page 1092.—*Mokuo Niki*, off the eastern end of Molokai, are two islets 198 ft. high, appearing as one except when bearing N. by W.

The northern coast of Molokai consists of a succession of precipitous cliffs, with a few off-lying islets or rocks.

Kalanao, or *Makanalua*, the leper settlement, is on the western side of the promontory extending from the central part of the North coast of Molokai, and contained about 1,000 patients. A *fixed red light* is shown on a mast at 64 ft. above the sea on *Lae o Kuihu*, the northern extreme of the promontory, 2 miles north-eastward of the settlement.

Lae o ka Laau, the S.W. extreme of Molokai, is a low black point with a breaking reef extending about half a mile westward from it. The *light* is shown from a black frame tower 35 ft. high.

Kaiwi Channel has deep water, but in its southern approach lies an extensive bank of soundings named *Penguin Bank*, after H.M.S. *Penguin* whose officers discovered it in 1897, with deep water close to its northern, western, and southern edges. This bank has general depths of 22 to 39 fathoms over it, but in 1903 Capt. T. J. Keeney, of the fishing schooner *Brothers*, reported that he found less than 10 fathoms in about lat. 21° 4′ N., long. 157° 37′ W., and that other fishermen have found as little as 7 fathoms; this would be about 18 miles W. by S. ½ S. from Lae o ka Laau.

Pages 1092-1093.—**OAHU** has two ranges of mountains running nearly parallel with its N.E. and S.W. sides, between which is the fertile Ewa valley. The *Konahaunui* or N.E. range rises to an elevation of 3,105 ft. near its S.E. end, and the *Kaala* or S.W. range rises to 4,030 ft. near its N.W. end. The island produces considerable quantities of sugar, mostly by means of irrigation. A railway extends along the southern, western, and northern shores, from Honolulu to Kahuku, a distance of 71 miles. There is a *wire-*

less telegraph station at Waialae (call letters UC), and the principal places are connected by telephone.

In approaching and leaving Honolulu, vessels are stated to have experienced a westerly current sometimes running 2 to 3 knots an hour.

Page 1093.—**Makapuu Point,** the eastern extreme of Oahu, is a bluff 642 ft. high, on which it is proposed to establish a lighthouse. Between this and Mokapu Point the coast is skirted by a reef reaching more than a mile off in places, and on which lie some scattered islets and rocks. The bay westward of the latter point is filled with reefs between which is a 9-ft. passage into *Wailai Harbour*. Hence to Kahuku Point there is nothing to note except that the coast appears to be fringed with reefs, and the terminus of the railway is in *Laie Bay*, in which are some off-lying islets.

Kahuku Point, north-westward of Laie Bay, is the northern extreme of Oahu; it is low and the reef is stated to reach upwards of 1½ mile off it.

Page 1094.—**Waimea Bay**, 7 miles south-westward of Kahuku Point, is only a small indentation, but there is a considerable settlement here, engaged in the cultivation of sugar, &c. Depths of 6 to 7 fathoms are found upwards of half a mile off the river entrance, shoaling gradually to the shore; it increases rapidly seaward.

Waialua or *Kawailoa Bay*, 4 miles south-westward of Waimea, is nearly filled with breaking reefs, between which there is an inlet less than a cable in width, which had depths of 7 fathoms and under, but in 1898 the bay was partly filled up with sand during a heavy N.W. gale, where the chart shows 5 to 7 fathoms. There is anchorage a mile off the hotel on the S.E. shore. Rice is grown in the vicinity.

Kaena Point, 10 miles westward of Waialua, is a long narrow projection with a reef off it.

Pages 1094-1095.—**Waianae Bay**, 10 miles south-eastward of Kaena Point, has large sugar plantations in the vicinity, but there is no sheltered anchorage. The isolated rocky peninsula, 1½ mile north-westward of the village, is named *Lahilahi*.

Laeloa or Barber Point Lighthouse is a coral tower showing a *fixed bright* light at 43 ft. above the sea, visible 10 miles. Between this and Pearl Lochs the coast is a low plain fringed with a reef.

In 1890, it was reported that a dangerous reef extended southward from Laeloa Point. This was shortly afterwards searched for by H.M.S. *Nymphe*, when a depth of 14 fathoms was found about 1½ mile S. ¾ E. from the lighthouse, 5 fathoms at one mile, and 3 fathoms at 7 cables, and similar depths were found about 1¼ mile northward and eastward around the point.

In 1891, H.M.S. *Gannet* unsuccessfully searched for a reef reported by the captain of the steamer *Oceanic* to lie 2¾ miles S.E. by E. from the lighthouse; 16 fathoms was found at 2¼ miles S.E. ⅓ E. from the lighthouse, and 41 fathoms at 2⅔ miles S.E. of it.

Page 1095.—**PEARL LOCHS** have come into prominence as a proposed U.S. naval station, and it is intended to strongly fortify them and the adjoining port of Honolulu. A channel 200 ft. wide has been dredged over the bar to a minimum depth of 30 feet at low water, and within this the channel increases quickly in depth, being navigable by vessels of the largest size into the lochs, which afford spacious and secure landlocked anchorage. The dredged entrance is marked by *red spar buoys* on the eastern side, and *black spar buoys* on the western side, and within these some of the projections of the reefs are marked by pile *beacons* similarly coloured. On the reef off Queen Emma's house, a yellow building on the eastern point of the harbour entrance, are two *beacons* which in line, bearing about N. by W. ½ W., lead through the dredged entrance. On the western point of the harbour is the village of *Puuloa*, where salt is made in large quantities.

As the Pearl Lochs are of no commerical importance to shipping, the chart will give any farther particulars, and no stranger could safely navigate them without the aid of local knowledge. There is a bank of soundings off the edge of the reef, which here extends about a mile off shore, on which vessels can anchor in not less than 10 fathoms, within the *red* sector of Diamond Head light.

At 3½ miles eastward of Pearl River entrance is a gap in the shore reef named *Kalihi Entrance*, and at 1¼ mile farther on is the entrance of Honolulu Harbour.

Pages 1095-1099.—**HONOLULU** remains the capital of the Hawaiian group, and contained 39,306 inhabitants at the census in 1900, but now estimated to number 45,000. (Particulars of its trade are given in the Addenda for page 1065.) It is well lighted by gas and electricity, and there is a good service of tramways in and around the city. Supplies of all kinds may be had here, but Capt. C. Meyer, German ship *Roland*, stated

they were very dear, drinking water costing 5 cents a gallon on the wharf. Stone ballast is plentiful. Large quantities of coal are stored here, and can be rapidly put on board steamers lying at the wharves, or is brought off in lighters; in 1903, H.M.S. *Amphitrite*, of 11,000 tons, drawing 29 ft., was coaled at the wharf. The hospital will admit seamen.

Extensive repairs can here be executed for hull and machinery, and the patent slip can raise weights up to 1,400 tons. A steam-tug may be had if required. A *wireless* telegraph station is maintained here (call letters UC).

The climate is generally healthy and pleasant, but southerly and south-westerly winds (which are not frequent) give rise to fevers, &c.

Time Signal.—At a mill near the custom-house a steam whistle is sounded daily at noon and 1h. 30m., p.m., mean time of long. 157° 30′ W., equivalent to 10h. 30m., p.m., and midnight, G.M.T. It is not sufficiently accurate for rating chronometers.

In 1903, telegraphic observations with San Francisco determined the position of the Transit of Venus (1874) observation spot to be in long. 157° 51′ 56″ W., practically coinciding with the British astronomical result of 1874, and only 4½′ eastward of the position given by Captain Cook, in 1785.

The harbour was originally a mere break in the shore reef, but it has been greatly improved in recent years by dredging and embanking, and vessels of the largest size can now lie afloat alongside the wharves. Including the approach it is about a mile in extent North and South, but its greatest width is less than 2 cables; it has been dredged to a uniform depth of 35 feet at high tide, to be increased to 37 feet.

Pilots.—There is a compulsory charge for pilotage, and a pilot usually cruises between the harbour and Diamond Head.

The entrance to the harbour has been dredged to a least depth of 34 ft. at high tide over a width of about 400 feet. A *black can buoy* lies in about 5 fathoms on the western side of the entrance, and a *red nun* buoy on the East side. Within these the edges of the reefs are marked by pile *beacons*.

Tides.—It is high water, on full and change, at 3h. 40m., the mean rise being 2 feet.

Page 1097.—**Lights.**—The outer leading light, shown on a white pile beacon, is now *fixed red*; the inner one, *green*, is shown on a white framework, and may be obscured by shipping. Both are difficult to distinguish from the city lights. When electric, the *green* light is elevated 60 ft., and when an oil light 45 feet. In line, bearing N. by E. ¼ E., they lead to the entrance but not through the channel.

Southward of the outer leading light, the dredged channel is marked by *three fixed* lights on each side, 11 ft. above high water, *bright* on the West side and *red* on the East; they are shown on piles about 70 ft. within the edges of the reefs, and about 300 yards apart.

Directions.—Sailing vessels bound to Honolulu from the South or West are recommended to pass northward of Hawaii, Maui, and Molokai, as they are liable to be becalmed if approaching the southern sides of these islands. When bound northward or eastward from Honolulu, they should steer S.W. for 30 miles or more before hauling up to the northward.

Though pilotage is not compulsory, it is advisable not to enter the harbour without a pilot. Koko and Diamond Heads form good marks in approaching, and the light on the latter is a good guide by night. As before stated, the leading lights do not lead through the dredged channel. The *bell-buoy*, now painted *red*, is a good guide for the anchorage, south-eastward of the harbour entrance, and at night, the *green* light should be kept well open eastward of the *red* light, to keep clear of the fairway. The *red* sector of the Diamond Head light forms a valuable guide for approaching the anchorage, over which the light is obscured.

DIAMOND HEAD Light.—From Honolulu the coast trends 4 miles S.E. by E. to Leahi or Diamond Head, and the fringing reef in some places reaches half a mile off shore. On the head stands a white stone tower 40 ft. high, showing a *fixed* light at 132 ft. above the sea, visible 15 miles; *bright* seaward between N. 83° E. and S. 89° W.; *red* thence towards Pearl River entrance to N. 80° W.; obscured elsewhere.

On the slope of the hill, eastward of the lighthouse, is a Lloyd's *Signal Station*, 120 feet above the sea. In gales, the sea breaks in 7 to 10 fathoms, for three-quarters of a mile southward of the head.

Page 1099.—*Waikiki* is a mile north-westward of Diamond Hill, and will be known by a large hotel. The anchorage off it is foul.

At 6 miles E. ¾ N. from Diamond Head is *Koko Head*, 644 ft. high, and the barren rocky cliff between forms the open bight named *Waialae Bay*. North-eastward of Koko Head is *Koko Crater*, 1,205 ft. high, and 2½ miles beyond this is Makapuu Point.

Pages 1099-1100.—**KAUAI** produces considerable quantities of sugar and coffee, chiefly by means of irrigation. The principal places are connected by telephone.

Page 1100-1101.—**Nawiliwili Harbour.**—*Carter Point*, the South point of the entrance, is a high steep bluff, and a breaking coral spit extends 4 cables northward from it, or to within $1\frac{1}{3}$ cable of *Kuku Point*, leaving a 4-fathoms channel between. At two-thirds of a mile eastward of Kuku Point is *Ninini Point* 30 to 40 ft. high, where is a sugar plantation, and on its extremity is a white mast showing a *fixed bright light* at 55 ft. above the sea, visible 10 miles.

About 2 cables north-westward of Ninini Point is a small patch of sand, off which there is anchorage in 6 fathoms, fairly sheltered from the trade wind. Hence boats can pass close round Kuku Head northward and westward to the wharf in the N.W. angle of the bay, the reef extending off which is guarded by a *red buoy*, lying about $1\frac{1}{4}$ cable north-westward of Kuku Head. The observation spot is now considered to be in long. 159° 21′ 20″ W.

Page 1101.—**Hanamaulu Bay,** 2 miles northward of Ninini Point, is an indentation half a mile in extent by $2\frac{1}{2}$ cables in width, the depth decreasing gradually from 6 and 7 fathoms in the entrance. On the South point of the entrance is a conspicuous white storehouse, and within the point on the opposite side to the north-westward is a landing pier. There is a mooring buoy for the mail steamer, in 6 fathoms, about a cable westward of the South point.

A *fixed red* lantern *light* is shown on a mast about 100 yards northward of *Makanuena Point.*

Koloa Bay is about a mile westward of Makanuena Point; the anchorage here is very exposed, and the mooring *buoy* no longer exists. Supplies of fresh beef, vegetables, and fruit may be had here. Hence to *Hanapepe*, a distance of 7 miles, the coast is hilly but partly cultivated; about midway between is *Wahiawa*, at a mile off which lies *Kalanipuao Rock* with only 3 ft. water over it; a *can buoy*, *red* and *black bands*, lies in $7\frac{1}{2}$ fathoms, 100 yards S.E. by S. from the rock. Between Hanapepe and Waimea, $5\frac{1}{2}$ miles to N.W. by W., are large sugar plantations.

Pages 1101-1102.—**Waimea Bay** should be approached with caution, on account of the fringing reefs. From a distance its position will be recognised by the high chimneys of the sugar-mills at *Kekaha* and Makawili, westward and eastward of it. Behind the village of Waimea is the church, a conspicuous brown building; this kept open a little westward of the pier, and bearing N. $\frac{3}{4}$ E., will lead to the anchorage in $5\frac{1}{2}$ to 7 fathoms, half a mile off the pier, or farther out in 10 to 15 fathoms. A considerable swell is felt here, and the surf often renders landing impossible.

Makawili, about a mile eastward of Waimea, affords better landing, and the anchorage in $7\frac{1}{2}$ fathoms, half a mile S.W. of the pier, is more sheltered. About $1\frac{1}{2}$ mile eastward of the anchorage is a conspicuous chimney upwards of 200 ft. high. In approaching bring the pier to bear N.E.; H.M.S. *Wild Swan* found as little as $5\frac{1}{2}$ fathoms at $1\frac{1}{2}$ mile off shore, on either side of this line of bearing. To the eastward the reef reaches three-quarters of a mile off shore.

A *fixed red* lantern *light* is shown on a mast on *Kokole Point*, on the West coast of Kauai.

Pages 1102-1103.—**Hanalei Bay** breaks right across during N.W. gales. A remarkable double peak in the mountains behind, or the white roof of the church among the trees, bearing S.E. by S., will lead into it. Boats land near the chapel on the South side of the river running into the eastern angle of the bay. The sandy patches on the adjoining shore shift according to the prevailing current, which is westerly during the N.E. trade season, and easterly at other times. Vessels must not rely upon obtaining fresh supplies here, but fish is plentiful.

From Hanalei the coast trends in a curve westward to southward, for a distance of 14 miles, to Kanala Point, and has several villages along it. *Kanala Point*, the N.E. extreme of Kauai, is a low rounded projection, backed by a remarkable isolated forked hill; a *fixed red* lantern *light* is shown on a mast on the point. Hence the coast trends 6 miles southward to Wailua, and has extensive sugar plantations along it.

Pages 1103-1104.—**NIIHAU** rises to an elevation of 1,500 ft. near the middle of its eastern side, but elsewhere is mostly low, there being a level fertile plain on the western side from 2 to 4 miles in width. There are now but few people on it.

Yam Bay is $1\frac{1}{2}$ mile southward of *Kana Point*, which is low and sandy, with breakers extending nearly $1\frac{1}{2}$ mile off it. Vancouver anchored about $1\frac{1}{2}$ mile S. 25° W. from Kana Point. *Cook's Anchorage* is about 4 miles southward of Kana Point.

Pages 1105-1106.—**MODU-MANU, Nihoa**, or *Bird Island* lies about 122 miles N.W. by W. ¾ W. from Niihau, *Miller Peak*, 903 ft. high, at the N.W. end, now being placed in lat. 23° 5′ 50″ N., long. 161° 58′ 32″ W.; the eastern peak is 869 ft. high. It is 8 cables in extent East and West, and 1½ to 3½ cables in width. The East, North, and West sides are precipitous, but the southern side is indented by three small bays, where boats may land in fine weather. When examined as to its suitability for a submarine cable station, it was found to be surrounded by an extensive bank with general depths of 20 to 35 fathoms, extending 14 miles off the N.E. side and 11 miles eastward. In 1897, the U.S.S. *Yorktown* sounded in 47 fathoms, at 11 miles N.E. by N. from the island. It appears that anchorage can be had about half a mile off the lee side, according to the wind, in 14 to 20 fathoms, sand and broken coral.

Page 1107.—**ALIJOS ROCKS** lie about 160 miles south-westward from the nearest part of the coast of Lower California. Careful observations by Capt. J. Robinson, steamer *Drumcairne*, 1906, placed them in lat. 24° 55′ N., long. 115° 44′ W.

Capt. T. Fenlon, steamer *Col. E. L. Drake*, reported that at noon on June 27, 1907, he passed within 2 miles of what appeared to be a breaking reef about 400 ft. long and 10 ft. high, at 27 miles S.W. by S. ⅛ S. from Los Alijos, or in about lat. 24° 41′ N., long. 116° 10′ W.

Pages 1107-1108.—**GUADALUPE ISLAND** was surveyed by the officers of the U.S.S. *Gedney* in 1897, and the North point is now placed in long. 118° 17′ 30″ W. It is not inhabited. *Melpomene Cove* is the anchorage off the southern shore, where H.M.S. *Melpomene* lay in 14 fathoms, with the South Bluff bearing E. ⅓ N., and the South end of Inner Islet S.W. ¼ S. The best landing is within a rock 35 ft. high near the West end of the bay. *Outer Islet* is 677 feet high, and *Inner Islet* 744 ft., the channel between them being deep.

On the eastern side of Guadalupe, at 2½ miles southward of the North point, are some abandoned buildings in a small cove, off which there is anchorage. On the western shore, 6 miles northward of the S.W. point, is a long projecting point forming a bay on its southern side known as *West Anchorage*. A sunken rock lies two-thirds of a mile off shore, about 2 miles southward of the latter point.*

Page 1108.—**Erben Bank** is a remarkable submarine elevation discovered in 1874 by Commander H. Erben, U.S.S. *Tuscarora*, when a depth of 404 fathoms was found in lat. 32° 52′ N., long. 132° 31′ W. A sounding in 388 fathoms, rocky bottom, was afterwards obtained from the U.S.S. *Ranger*, in lat. 32° 54′ N., long. 132° 33′ W. Depths up to 2,833 fathoms have been found in the surrounding region.

Page 1109.—**REED ROCKS** were again reported from the ship *British Yeoman* in 1888; and in 1899 Capt. T. Harkins, schooner *Una*, reported having passed close to a peaked rock with seaweed attached, showing 4 ft. above the sea, in lat. 37° 24′ N., long. 137° 26′ W.; no soundings were taken and the water was not discoloured. In 1901, an

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* DOUBTFUL DANGERS.—*Michelet Reef.*—Capt. M. Rosé, French barque *Michelet*, reported that on January 18, 1907, he passed within a cable of a breaking reef, about 15 yards in extent, in lat. 22° 19′ N., long. 131° 6′ W., but took no soundings. On August 27, 1907, Capt. R. T. Lawless, steamer *Mariposa*, passed here keeping a careful look-out, and saw no signs of such a reef in long. 131° 16′ W.

On March 2, 1895, Capt. Fraser, ship *Lonsdale*, observed a patch of very light green water 200 or 300 yards in extent, in lat. 22° 29′ N., long. 131° 20′ W., but took no soundings.

Henderson Island or *Cave Rock.*—In 1892, Capt. Bailey, ship *Drumrock*, passed over the assigned position (lat. 24° 12′ N., long. 128° 32′ W.) and saw no sign of it. In 1893, Capt. Henderson, schooner *Golden Shore*, also saw nothing of it.

Legarde Rock.—In 1899, the U.S.S. *Albatross* passed near the given position (lat. 31° 12′ N., long. 125° W.), and saw nothing of it; a depth of 1,955 fathoms was found in the immediate vicinity. Other vessels have also passed this position, and no signs of it were visible.

Cambrian Monarch Rock.—In 1891, Capt. J. Richards, ship *Cambrian Monarch*, reported that he passed within half a mile of a pinnacle rock about 7 ft. high and only 9 ft. in diameter, in lat. 29° 2′ N., long. 137° 59′ W. No soundings were taken. In 1901, the U.S.S. *Philadelphia* passed near this position, but nothing was seen of it. On May 8, 1902, a careful and unsuccessful search was made of the surrounding region by the officers of the U.S.S. *Wheeling*, when a depth of 2,548 fathoms was found in the given position; a floating vertical log was seen in the vicinity.

The *Wheeling* also made a careful and unsuccessful search for the *shoal* reported in lat. 27° 40′ N., long. 140° 49′ W., when a depth of 2,665 fathoms was found in this position. Several shoal spots were reported by the look-outs, but they proved to be "slick" spots; one had every appearance of broken water. Other vessels have also passed through this region, and no sign of a shoal was visible.

exhaustive search for this reported danger was made by the U.S.S. *Wheeling*, and numerous deep soundings, some upwards of 3,000 fathoms, were taken, precluding any possibility of its existence; from this unsuccessful search, and other reports of passing vessels, it is now considered not to exist.*

Pages 1109-1110.—**NECKER ISLAND** was annexed by the Hawaiian government in 1894. In that year, also, it was surveyed by the officers of H.M.S. *Champion*, and found to be 1,350 yards long East and West, and only 250 yards across where widest, its western peak being placed in lat. 23° 35′ 30″ N., long. 164° 39′ 58″ W. It is a barren rugged volcanic island, with steep and cliffy shores, its summit rising in four flattish peaks varying from 240 to 300 ft. in height, with patches of dwarf shrubs on them. Landing is impracticable when there is any swell; the best place is in *West Cove*, on a ledge of rock on its South side, whence there is a rough track up the cliff. *East Cove*, southward of the northern peninsula, is quite open to the prevailing N.E. trade. There are several paved artificial terraces on the island, partly encircled by low walls or pillars of lava, where some rough stone images were found, showing it must at one period have been inhabited. A little fresh water was found in a cave at the East end, and sea-birds were numerous.

Depths of 8 to 17 fathoms, rock and sand, were found at half a mile off around the island, where vessels might anchor. The surrounding bank extends 19 miles to the N.E., 33 miles S.E., 9 miles S.W., and 8 miles N.W., with depths from 13 to 21 fathoms, coral and sand.

The prevailing winds appear to blow strongly between North and N.E., westerly winds being rare. September is said to be the calmest month. The rainfall must be heavy. The current ran westward on the North side of the island, and eastward as an eddy current on the South side.†

Pages 1110-1112.—**FRENCH FRIGATES ATOLL** has not yet been closely examined and can only be safely approached from May to September. It was annexed to Hawaii in 1895, but is only visited occasionally by Japanese schooners for shark-fins, oil, and turtle. The current in the vicinity was observed to run south-westward, about 2 knots an hour. The islet is now considered to lie in long. 166° 17′ 52″ W.

Page 1112.—**Brooks Shoal.**—The 14-fathoms patch is now charted in about long. 166° 53′ W.

Two Brothers Reef was carefully but unsuccessfully searched for by the U.S.S. *Albatross* in 1902, soundings from 1,356 to 1,969 fathoms being found within 2 to 10 miles from the given position. In 1904, the schooner *Mindoro* passed over its site, and nothing was seen of it.

MARO REEF is now charted in lat. 25° 30′ N., long. 170° 33′ W. (centre).

Page 1113.—**Dowset Reef** is now charted in lat. 25° 21′ N., long. 170° 29′ W.

Pages 1113-1114.—**LAYSAN ISLAND** is under Hawaii, and was surveyed by U.S. officers in 1902. It was leased to a company for working the guano deposit, which was exhausted in 1904 and the island again abandoned. Loading was only possible from April to September, at the anchorage in 10 fathoms, nearly a mile westward of the settlement, which was at the head of an indentation in the reef on the N.W. shore. The island is nearly 2 miles in extent North and South, and over a mile in greatest width, its North end being placed in lat. 25° 42′ 14″ N., long. 171° 44′ 6″ W.

Laysan is frequented by myriads of sea-birds for breeding purposes, of which an interesting illustrated account is given by Prof. C. C. Nutting in "Popular Science Monthly," 1903, pages 321-332.

Pages 1114-1115.—**LISIANSKY ISLAND**, according to the U.S. plan of 1905, is of rectangular form, a mile in extent N.N.W. and S.S.E., half a mile in width, and from 20 to 42 ft. high; the same chart places the S.W. point in latitude 26° 1′ 22″ N., long. 173° 59′ 15″ W. It is surrounded by an atoll reef distant about 1½ mile eastward and westward, and less elsewhere. Within the atoll barrier are numerous detached

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* In May, 1894, Capt. W. G. Tibbetts, schooner *Salvator*, reported having passed through discoloured water between lat. 41° N., long. 147° 30′ W., and lat. 43°, long 146°; seabirds were numerous, and there was a strong smell of seaweed.

Palmer Reef.—In 1902, Capt. A. V. Brown, barque *Collingrove*, reported having passed a mile South of the given position and saw no sign of it.

† *Frost Shoal* was crossed by the U.S.S. *Yorktown* in the night of October 14, 1897, when a least depth of 12 fathoms was found in lat. 23° 45′ 30″ N., long. 163° 25′ W., and 25 to 63 fathoms within about 8 miles eastward and westward, bottom of mud, sand, or rock.

reefs, and the island itself is fringed with them, there being boat passages between them. The best entrance to the lagoon is at the extreme western point, with a depth of 5 fathoms, decreasing within to 4 fathoms.

In 1900, the captain of the ship *Springbank* reported that his vessel struck on a reef 11 or 12 miles south-eastward of Lisiansky, and was 14 days extricating her from shoals and reefs. From this and other reports, it is considered probable that a bank extends south-eastward for about 30 miles from the island, with reefs on it.

Pages 1117-1122.—**MIDWAY ISLANDS**, so named in reference to their position in the North Pacific Ocean, have come into prominence as a station for the submarine telegraph cables from Honolulu and Guam in connection with San Francisco and Shanghai. The following observations are chiefly derived from U.S. sources, and include information derived from Capt. F. D. Walker, of the barque *Wandering Minstrel*, which was wrecked in Welles Harbour in 1888, he and his crew remaining here 14 months before being rescued; and the report on the survey made by the officers of the U.S.S. *Iroquois*, in 1900. An interesting account of the sea-birds which frequent them is given by Mr. W. A. Bryan in "Occasional Papers of the Bernice Pauahi Bishop Museum," vol. ii., No. 4, pp. 37-45, published in Honolulu, 1906.

The atoll reef is surrounded by a bank of soundings varying in width, with depths from 10 to 30 fathoms at half a mile off, deepening quickly farther seaward. There are no outlying dangers, but the water is shoaler off the N.W. side than elsewhere, the 100-fathoms line here reaching more than 7½ miles off. To E.S.E., 100 fathoms is found at 5 miles off, and on the N.E. and South sides at only 1¼ mile off.

Cable Station.—Vessels should not attempt to make the islands at night, the land not being visible very far off. By day the buildings at the cable station on Sand Island may be seen about 12 miles off.

The best outside anchorage is southward of the West end of Eastern Island, in 7 to 25 fathoms, the bottom here being of white sand and almost free from coral. The anchorage in Seward Roads is now confined, owing to the telegraph cables. There is very good anchorage in 10 to 12 fathoms, sand, north-westward of Middle Ground, with North Breakers in line with the inner angle of South Reef. Vessels can also lie in 10 to 12 fathoms, off the N.W. side of the atoll, on patches of sand. There is no anchorage off the N.E. or S.W. sides of the atoll.

Capt. Walker, who spent two winters here, stated that from the middle of October to the middle of April he would advise no vessel to visit the islands, as the wind then blows incessantly between S.E. and N.W., round by S.W., gales being very frequent, causing the barrier reef, the lagoon, and the harbour bar to be constantly breaking. The holding ground being coral sand is not good. In winter, the temperature has been as low as 57° F.

Winds.—In summer, the N.E. Trade wind blows steadily from the middle of July to the end of August; at other times the winds are generally light from N.E., S.E., or S.W. At this season the bar and lagoon are smooth.

Currents.—Outside the atoll, the current generally sets strongly northward, but with ebb tide may slack or even reverse. Heavy tide-rips have been observed 3 miles eastward of the S.E. point.

The lagoon is mostly very shallow, but in its central part is a basin with depths of 3 to 12 fathoms with numerous coral heads, and only accessible to small vessels.

Page 1118.—**Eastern Island**, was formerly known as *Middle Brooks Island;* there is a shifting sand islet off its western point.

Sand Island, formerly *Lower Brooks Island*, has the telegraph cable settlement on its northern end, the flagstaff on the summit (43 ft.) now being charted in lat. 28° 13′ 15″ N., long. 177° 21′ 30″ W.; in the vicinity are two conspicuous windmills 90 feet high. Attempts at cultivation have not met with much success, owing to the drifting sand, and all supplies have to be brought by the relief steamer.

Light.—Near the beacon on the summit of Sand Island is a white shed with a red roof and a white mast, on which a *fixed white* lantern light is shown at 73 feet.

Welles Harbour affords spacious and usually safe anchorage for vessels drawing up to 18 ft., but the sandy bottom does not hold well. In winter, in fine weather, it would be dangerous for a vessel drawing 16 ft., as the heavy swell then reduces the available depth on the bar. The harbour is studded with large coral patches, and has some sand-bars dividing it into three basins; the coral heads show dark purple against the blue or green water over sand.

North Breakers, on the northern side of the entrance, are awash at low water and always break. At half a mile farther northward is *Middle Ground*, generally marked

by breakers. At 2 miles north-eastward of the latter is a shifting low sand islet, about 3 cables S.E. of the N.W. point of the atoll reef.

Between North Breakers and the northern end of the southern reef, the entrance of Wells Harbour is less than half a mile in width, and at a short distance within is crossed by a very dangerous coral bar, on which are numerous patches of 12 to 17 ft., with narrow passages having depths up to 20 ft. between them. Vessels entering keep over towards the southern reef, sending a boat ahead to mark the best channel over the bar, only about 25 yards in width between the depth of 17 ft. on either side.

Beacons and *Buoys.*—On the summit of Sand Island, near the light station, is a pole bearing a *black triangle* with a *white stripe*, base upwards; and at 460 yards N. 77° W. from this is a *black triangle* 10 ft. high with a *white diamond* in the centre, base downwards. These beacons in line, bearing S. 77° E., lead over the bar in the best water, keeping over the white sand in the narrows, up to the *Hook spar buoy*, when the course can be altered to about S.S.E., till the inner beacon bears E. ¾ S., which will lead westward and southward of the Hook to the anchorage in 5 fathoms and under.

Vessels can also anchor northward of the Hook, and here a *mooring-buoy* lies in 6 fathoms, over 1⅓ mile N.W. by W. ⅞ W. from the inner beacon. This anchorage, however, is more exposed to westerly and south-westerly gales, and is farther from the landing place. The *Wandering Minstrel* was lost here.

Tides.—It is high water, on full and change, at 3h. 34m.; ordinary springs rise 18 inches, neaps about 12 inches. There is usually but little current in the harbour, and that generally westward, but in heavy gales there are strong currents and eddies; they run strongest with flood tide.

Seward Roads.—This anchorage is now limited in area, owing to the *telegraph cables* passing over it, and is practically confined to a small space within a quarter of a mile westward and southward of North Breakers. Vessels are requested not to anchor southward of a line W. ⅞ S. from the South end of the northern reef, or northward of a line S.W. by W. ⅛ W. from the North end of the southern reef. Within the bar, the cables take an E. by S. ½ S. direction over the Hook, and then eastward towards the landing pier on the North side of Sand Island.

Beacons have been erected on the South end of Sand Island to lead to and through Seward Roads up to the best channel over the bar. The rear beacon appears like a *black windmill*, and about 300 yards N. 49° W. from it stands a *triangle* 8 ft. high, point upwards, *black* with a *white cross*, and surmounted by a pole and *cross*.

Southern Passage.—On the South side of the atoll, about midway between Eastern and Sand Islands, is a narrow break in the barrier reef, with a depth of about 12 ft., through which the boats of the U.S.S. *Petrel* passed in March, 1905, and landed stores on Sand Island, finding about 10 ft. water in the channel within. The anchorage here is mentioned previously.

Page 1122.—**Nero Bank.**—In 1899, the officers of the U.S.S. *Nero* reported having sounded in 82 fathoms, in lat. 27° 58′ N., long. 177° 45′ W., or about 30 miles south-westward of Midway Islands.

OCEAN or Cure' Island.—We have no later description than that by Captain W. Reynolds, U.S.N. The entrance of the lagoon has depths of 2½ to 4 fathoms, and is now charted in lat. 28° 25′ 45″ N., long. 178° 29′ 45″ W.

Page 1123.—**Krusenstern Rock** was not seen from the barque *Craigerne*, Captain R. Suffern, which passed over the given position in 1897. In 1901, Capt. C. Petersen, steamer *Eva*, reported having passed breakers in lat. 21° 55′ N., long. 176° 5′ W., or about 35 miles south-westward of the above position.

Patrocinio or Byers Island.—In 1888, the barque *Altcar* passed near the position given by Capt. Morrell, and Capt. R. Magrath reported no sign of land could be seen. In 1898, a thorough but unsuccessful search was made by the steamer *Noeau;* and it is considered not to exist.

Pages 1123-1124.—**Morrell Island** has also been removed from the chart, having also been searched for in vain by the *Noeau*.

Page 1124.—**Mellish Bank and Crespo.**—Nothing more is known of these.*

Pages 1125-1126.—**MARCUS ISLAND** was claimed by the Japanese, being known to them as *Minami Tori shima*, and used from October to January as a station for gathering albatross, shark-fins, and tunny. It was ultimately decided to belong to

* A *bank reported* in lat. 30° 50′ N., long. 177° 30′ E., appears not to exist. In 1901, Capt. W. Finch, steamer *Gaelic*, reported having passed over or near this position several times, and in 1902 the U.S.S. *New York* passed over it, and no bottom could be found at 100 fathoms.

the United States, in 1903, as the result of a guano company's operations here in June, 1889.

In 1902, it was examined by Mr. W. A. Bryan, of the Bernice Pauahi Bishop Museum, Honolulu, who (in the well illustrated "Occasional Papers" of that institution, vol. ii., No. 1, 1903, pages 77-139) describes it as roughly triangular in shape, about 5 miles in circumference, the longest side measuring less than 2 miles, and reaching a maximum elevation of 75 ft. near the North end. The island is occasionally visited by violent storms and inundations, and landing is next to impossible from September to April, owing to the furious surf; during the other months, when the trade wind blows steadily, landing is generally safe, the usual place being a small break in the reef on the southern side, about half a mile from the S.W. point. There is no good anchorage, but vessels have lain in 14 fathoms, half a mile off the South side. There are some cocoanut plantations, but the people tending them are dependent upon rain for drinking water. There is much driftwood and wreckage on its shores. It appears to be an ancient atoll, having several depressions evidently the site of the interior lagoon, and is surrounded by a fringing reef.

In January, 1901, Capt. T. L. Weiss, steamer *Belgian King*, found a Japanese settlement on the South side, and got no bottom at 50 fathoms at half a mile from the shelving white beach. The best landing appeared to be on the South side near the eastern end. The sea was breaking heavily on reefs extending about half a mile off the East end, a quarter of a mile off the West end, and fully half a mile off the North side. During the night, the current set the vessel eastward about 2 knots an hour, the wind being fresh from S.W. to West and W.N.W. in squalls. Observations placed the island in lat. 24° 20′ N., long. 154° 2′ E.*

From the flight of the birds, Mr. Bryan was led to believe that another island exists from 50 to 75 miles north-eastward of Marcus Island.

Capt. S. G. Birkholm reported that in February, 1897, the barquentine *Robert Sudden* passed through broken water and breakers for a distance of 4 miles, when in about lat. 24° 4′ N., long. 152° 26′ E., but took no soundings, the wind blowing hard, and the water having the appearance of a sunken reef.

Page 1127.—**Grampus Islands** were not seen in the assigned position from the ship *A. C. Ropes*, Capt. D. H. Rivers, in 1893, nor from the Japanese war-vessel *Kongo*, in 1900. They have been removed from the chart.

In 1898, the Japanese authorities announced that the captain of a sailing vessel had reported a sunken rock in lat. 29° 37½′ N., long. 141° 57¾′ E., about 120 yards long by 40 yards wide, with 7 ft. water over it, and covered with seaweed.

Pages 1128-1129.—**OGASAWARA, Arzobispo, or Bonin Islands** are comprised between the parallels of 26° 31½′ and 27° 45′ N., but their united area amounts to only 27 square miles. They are now under the control of a Japanese governor, who resides at Port Lloyd. Their name of Bonin is said to be a corruption of the Japanese word *monin*, meaning desert. In 1906, the Japanese inhabitants had increased to about 6,000, chiefly residing on Peel Island, and engaged in the cultivation of sugar, indigo, coffee, rice, maize, pineapples, bananas, etc., and the turtle and shark fishery. There is monthly steamer communication with Yokohama, and telegraph cables connect Japan with Port Lloyd and New Port or Okimura, and a cable runs from the latter to Guam.

The islands were surveyed by the Japanese in 1881-3. They are of volcanic origin, covered in places with thick limestone deposits, and have no hot springs or other signs of present volcanic activity. They are now also stated to be free from earthquakes.

The climate is reported to be healthy, the islands lying northward of the region of the N.E. trade wind, and eastward of the monsoons. In the three years 1898-1900, the temperature varied between extremes of 95° and 48° F. Typhoons may occur in October and May, and in winter the weather is sometimes stormy and wet.

Page 1130.—**PARRY GROUP.**—There are a few Japanese on *Mukojima*, the central and largest islet of the group.

Kater Island, *Yome* or *Kagata jima*, 7 miles southward of the Parry group, is now charted in long. 142° 13′ E., and was uninhabited.

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* *Page* 1126.—In 1901, Capt. J. T. Smith, steamer *City of Peking*, stated that he had many times passed over or within 5 to 10 miles of the *reef* or *island* reported to lie in the vicinity of lat. 31° 25′ N., long. 154° E., and seen no sign of land or sunken reefs.

The BEECHEY GROUP, the most populous of the Bonin Islands, is resorted to by swarms of turtle from about January to August, and sharks are also taken in large numbers during the summer for their fins and oil. Many of the mixed breed inhabitants could speak English of a sort.

Page 1131.—**PEEL ISLAND, or Chichisima,** is said to rise to an elevation of 1,200 feet. A 5-fathoms rock, with a sunken 6-ft. rock about 4 cables E.N.E. of it, lies about a mile north-westward of *Knorr Island* or *Minami jima.*

Page 1132. **Port Lloyd, or Futami Harbour,** is about 1½ mile in extent North and South, by a mile in width, with general depths of 20 to 26 fathoms, sand and coral, over its central part. Between Southern Head, or *Yagi sima*, and *Horton Shoal*, the clear entrance is about 4 cables wide. Square Rock, or *Yeboshi iwa*, is 3 cables north-westward of Horton Shoal. The beacon on Southern Head no longer exists, but a triangular *white* tripod *beacon*, 21 ft. high, has been erected on the eastern shore at 200 ft. above the sea, eastward of Castle Rock or *Kanameiwa;* this beacon kept in line with a white patch on the North side of Castle Rock bearing about East, leads into the harbour, midway between Horton and South Shoals.

Omura, on the N. W. side of Port Lloyd, is a picturesque little town, the residence of the Japanese officials, with a stone wharf and landing place. Whalers frequented the harbour from January to April, supplies of beef, pigs, poultry, turtle, fruit, and vegetables being obtainable here at moderate prices.

Page 1134.—*Fitton Bay* is known to the Japanese as *Tatsumi ura.*

At spring tides, the stream is said to run 9 knots an hour in the narrow channel between Peel and Buckland Islands.

Buckland Island, or *Anisima*, is 3 miles in extent, and provides pasturage for numerous cattle and goats. The anchorage in Walker Bay, or *Taki ura*, is in depths of 10 to 18 fathoms.

Stapleton Island, or *Ototo sima*, is 2½ miles in extent North and South, and has an islet off its North end.

Fisher or *Hillsborough Island* is named *Haha sima* by the Japanese. Sugar is grown in the valleys, and there are fine cattle on the island.

Page 1136.—**Coffin Harbour,** or *New Port*, is named *Okimura* by the Japanese, the settlement being in the northern cove.

Pages 1136-1137.—**VOLCANO or IWO TO ISLANDS** are claimed by Japan, being attached to the Ogasawara jurisdiction, but are of no commercial importance. They are mostly barren, but the surrounding sea abounds with fish.

Page 1137.—**San Augustino,** or *Minami Iwo to*, is now charted in lat. 24° 18′ N. long. 141° 28′ E., and was uninhabited. In 1901, the officers of the U.S.S. *Grant* reported that a reef extends at least 1½ mile N.N.W. from the North point, with rocks 10 ft. high on its inner part; and that another reef extends at least half a mile off the West side.

In November, 1904, a submarine eruption began about 3 miles N.N.E. of San Augustino, and in December the inhabitants of Sulphur Island observed an island rising from the sea, ultimately attaining a circumference of about 3 miles and an elevation of 480 feet. Some of the people landed on it in February, and ascended to the summit. In the following June it had subsided so as to be only 2½ cables in length and 10 ft. high, and in June, 1906, it had completely disappeared. The eruption smothered the island of San Augustino with mud and ashes.

Sulphur Island, or *Iwo to*, is frequented by sea-birds, and has no fresh water. The sulphur deposits would not pay to work, but there are a few Japanese colonists.

San Alessandro, or *Kita Iwo to*, was not inhabited.

Page 1138.—In 1895, the patch of discoloured water 1¾ mile W. ¼ N. from San Alessandro was seen from H.M.S. *Edgar.*

Page 1139.—**Linda** or *Euphrosyne Rock.*—Soundings of upwards of 2,500 fathoms have been obtained near the reported position.

Pages 1139-1140.—**DOUGLAS REEF, or Parece Vela,** was examined by the officers of H.M.S. *Amphion* in 1890, whose observations placed it in lat. 20° 27′ 50″ N., long. 136° 13′ 15″ E. It is about 2¼ miles in extent East and West, and 4 cables wide, having a rock about 10 ft. high at its western end, one about 8 ft. high near the centre, and a pinnacle about 2 ft. high at the eastern end. There appeared to be boat entrances to the lagoon on the N.E. and S.W. sides. Breakers were seen about a mile N.W. of the West end of the reef.

In 1902, the U.S.S. *Thomas* sighted the reef, and observations placed the western

rock in lat. 20° 24′ N., long. 136° 3′ E. In approaching, the breakers will probably first be seen, the rocks not being conspicuous.*

Page 1140.—**Kendrick Island** has been removed from the chart.

Page 1141.—**RASA ISLAND**, by good observations on the U.S.S. *Concord*, 1900, is in lat. 24° 29′ 30″ N., long. 131° 14′ 30″ E.

BORODINO ISLETS are flat-topped, covered with bushes, and no trees. The north-eastern islet is about 150 feet high, and the other 100 feet. In 1887, H.M.S. *Swift* steamed round them at 1½ cable distance from their perpendicular shores.

Page 1142.—**Abre-ojo** or *Langdale Island*.—In 1904, Capt. G. Jones, ship *Langdale*, reported that he passed within 3 miles of an island lying in about lat. 23° 8′ N., long. 129° 26′ E. It appeared to have six or seven palm trees on it from 50 to 60 ft. high.

Page 1142.—**TANEGA SIMA**, according to the Japanese survey, is 31 miles in extent and 6 miles in greatest width, rising to an elevation of 988 ft. at about 12 miles from its northern end; the southern summit is 690 ft. high. In April, 1895, a volcanic eruption was observed northward of the highest peak, from the U.S.S. *Baltimore*. The island contains over 23,000 inhabitants, who cultivate rice and other sub-tropical produce. The small bay on its N.W. side, 7½ miles from the North point, is named *Akawoki* or *Nishi no Omote wan*, and here telegraph cables are landed from Kiusiu and Yaku sima; there is anchorage here in 7 fathoms at 4 cables off shore. It is high water, on full and change, at 6h. 56m.; springs rise 8½ ft., neaps 5½ feet.

A 4-fathoms patch, named *Senohana*, lies 1¼ mile northward of the North extreme of Tanega sima.

Shimamu Road, 8 miles northward of the South point of Tanega sima, has anchorage in 7 fathoms, half a mile off shore, and there are landing piers at *Nakanocho*, in the southern angle of the bay. *O ura*, on the East coast opposite this, is sheltered by a chain of islands and rocks, forming a basin 2½ cables in diameter with depths of 5 to 8 fathoms, sheltered from all but north-easterly winds; the entrance, northward of the rocks, is only 1½ cable wide.

A chain of sunken rocks extends for 8 miles or more southward of *Otaki zaki*, the S.E. point of Tanega sima, with depths of 1 to 2½ fathoms over them, generally marked by ripples or breakers. Passing vessels are recommended to give these dangers a very wide berth, not approaching the South end of Tanega sima within 10 miles.

Mage no sima is 225 ft. high.

Page 1143.—**YAKU or Yakuno sima** appears to have no outlying dangers, and on its N.E. side is the village of *Miya*, where the telegraph cable from Tanega sima is landed. The island contains about 9,000 inhabitants, and has forests of good timber.

The LIGHTHOUSE on *Misaki* or *Cape Nagada*, the N.W. extreme of Yaku sima, is a white brick tower 50 ft. high, in lat. 30° 23′ 45″ N., long. 130° 22′ 30″ E., showing a *flashing bright* light every *minute*, at 229 ft. above high water, and visible 21 miles.

In 1897, the German war-vessel *Prinzess Wilhelm* passed near the S.W. coast of Yaku sima; the officers described it as steep and rocky, but the valleys are partly wooded. There were two sandy beaches with fishing villages. *Ko sima*, lying close off this coast, consists of several flat-topped rocks rising to an elevation of about 50 ft., and only easily made out from the South.

Kuchi no Yerabu or *Nagarobe sima* is about 7 miles in extent N.W. and S.E., by 3 miles in greatest width, and very mountainous, consisting of bare lava rocks, with a few bushes in the valleys. A peak near the South end rises to an elevation of 2,172 feet, and in the vicinity is an active volcano; the N.W. part of the island is 950 ft. high, and between is a comparatively low isthmus, half a mile in width. *Kuchinoyerabu wan*, on the South side of the isthmus, affords anchorage in 7 fathoms, sheltered from all but south-westerly winds.

The coast of Kuchi no Yerabu is fronted by rocks, but nowhere extending more than 2½ cables off. On the N.W. extreme stands a needle rock about 100 ft. high.

Yakuro or *Powhattan Reef* is in lat. 30° 43½′ N., and the highest rock rises 19 ft. above the sea.

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* *Bishop*, *Nautilus*, or *Vela Rocks* were not seen from the schooner *Rattler*, Capt. F. Nielsen, which passed over the given position in 1893.

Page 1142.—*Akin Reef*, reported in lat. 20° 37′ N., long. 132° E., was not seen from the U.S. missionary steamer *Morning Star*, which passed this position several times, in 1891 and previous years.

Page 1144.—**Use** or *Trio Rocks* lie 9 miles to W. ¾ S. from Iwoga sima, and in long. 130° 5½′ E.

KURO SIMA is thickly wooded, and only inhabited by a few fishermen, their villages being near the East and West ends. Boats can also land on the South side, where a waterfall was seen.

Pages 1144-1145.—**LINSCHOTEN ISLANDS, Tokara, or Shichi to** (Seven Islands) have a few poor inhabitants, and are of no commercial importance.

Page 1145.—**Tokara or Colnett Strait.**—No breakers were observed in the position of *Medusa Reef* from the *Prinzess Wilhelm*, in 1897.

Pages 1146-1147.—**LU-CHU ISLANDS** are now known to the Japanese as *Okinawa* or *Ryu-kyu* and to the natives as *Du-chu*, though the original name appears to be of Chinese origin, and is spelt in a great variety of ways. An interesting account of these islands, their people, productions, &c., is given in the "Geographical Journal," vol. v., 1895, by Professor Basil Hall Chamberlain, of which we have made use in the following description.

They comprise three groups of islands, the O sima, Sho Ryu-kyu, or northern group, under the Kagosima administration; the Okinawa, Great Lu-chu, or central group; and the Saki sima (Further Isles), Meiaco sima, or southern group; lying between the parallels of 28° 45′ and 24° 2′ N., and the meridians of 130° 2′ and 122° 55′ E. Many of them are of volcanic origin, some still having active volcanos; in others, as in the central group, the surface strata are of coral and limestone; and in the southern group, granite and other rocks are met with, and coal deposits are found on *Iri Omotejima*. A remarkable feature in their appearance is the numerous white burial vaults on the hillsides.

The population numbers upwards of 400,000. They first came under supreme Japanese control in 1872, having previously owned allegiance to both China and Japan. There is a great physical resemblance between the Lu-chuans and Japanese, and the languages of the two people resemble each other as much as the Italian language does the French; but the Lu-chuans have no perfect written system of their own, their literature being in Chinese or Japanese. Professor B. H. Chamberlain eulogises their gentleness of spirit and manner, whether rich or poor, their yielding and submissive disposition, their hospitality and kindness, and their aversion to violence and crime. Their chief article of food is the sweet potato, and in bad seasons they make use of an inferior kind of sago. They make an alcoholic liquor called *awamori* from rice and millet, and tea is in general use, being imported from Japan.

Sugar-cane is the chief article of cultivation, and others are rice, sweet potatos, tobacco, indigo, maize, &c. Small horses and cows, pigs, goats, dogs, and cats are domesticated, and wild boar and deer are found on the principal islands. Among the reptiles is a poisonous snake known as the *habu*, much dreaded by the people, and particularly in O sima and Toku no sima. The coasts abound with fish, but of comparatively poor quality, and the bite of one species of sea-snake is poisonous.

There is regular communication by steamer with Japan and the various islands, and from February to June (the busy sugar season) the service is more frequent. Nafa is the only port open to foreign vessels, and here is the seat of government. The principal islands are connected by telegraph cables, connecting Kagosima with Kelung in Formosa, landed at Tanega sima, Yaku sima, Amami O sima, Toku no sima, Oki no Yerabu, Nafa, and Port Haddington (Ishigaki).

The Climate varies in the different groups, but in all the winter is the dry season, most rain falling in late spring and summer. That of Great Lu-chu is healthy and pleasant though somewhat damp, while the northern and southern groups are very humid, the unhealthiness of Iri Omote being notorious from this cause, a local proverb saying it here rains "35 days a month." In the southern group, January and February are the wettest months; malarial fever mostly prevails in June and July; while October, November, and December are the driest and least unhealthy. All the islands suffer occasionally from destructive typhoons.

In a year's observations at Nafa, the temperature varied between extremes of 45° F. in January and 93° in August. The mean direction of the wind was north-easterly from October to April, and south-easterly from May to September. The rainfall amounted to over 100 inches.

The Kuro Siwo is only felt among the islands in August and at the height of the S.W. monsoon; at other times this current passes outside or north-westward of them, the currents to the eastward being weak and variable.

Page 1147.—**Sandon** or *Macedonian Rocks* are charted in lat. 28° 44′ 45″ N., long. 129° 47′ E., 14 miles N.N.E. of the N.E. extreme of Amami O sima.

AMAMI O SIMA, the second largest island of the Lu-chu groups, is 33½ miles in extent N.E. and S.W. and from half a mile to 15 miles in width, its rocky shores being much indented. It consists of an assemblage of hills and mountains, rising to an elevation of 2,300 feet, about 10 miles from its south-western end, but none are volcanos, and earthquakes are not experienced on this island. The climate is damp and unhealthy, but vegetation is luxuriant. The population numbers upward of 50,000.

Kasari saki, the N.E. extreme of Amami O sima, has foul ground extending about 2 miles northward, north-eastward, and eastward of it, usually marked by tide-rips; *Tonbara iwa*, the northern rock, is 97 ft. high. *Kasari Bay*, the deep inlet southwestward of this cape, has several arms, the south-westernmost being landlocked. A telegraph cable is landed here from Yaku sima, and another runs from the South side of the isthmus to Kikai ga sima.

Page 1148.—**Yakiuchi or Hancock Bay** affords sheltered but confined anchorage at its head, in 12 to 20 fathoms. *Yadato* or *Itateka sima* is 1,090 ft. high, its western or outer point (3½ miles N.E. of Sotsuko saki) being in lat. 28° 18′ N., long. 129° 11′ E.

LIGHT.—**Sotsuko** or *Sots-taka saki* is a high cliff with several off-lying rocks, and on it stands a white iron tower 33 ft. high, showing a *fixed bright* light, elevated 436 ft., and visible 20 miles.

Naze or Kaneku Harbour, 17½ miles E.N.E. of Yadato sima, extends 2 miles southward, with a small arm named *Okuma Harbour* on its eastern side. The shores are fringed with reefs, and on that extending off the West side of the entrance stands *Tachi gami Islet*, 85 ft. high. The water is deep in the fairway, and there is anchorage in either arm, but exposed to northerly winds. At the head of the southern arm is the town of *Naze*, the chief port of the island.

O Sima Strait.—Three telegraph cables are landed in the small bay on the North side of the western entrance. *Akase* or *Waré Rock*, the outermost of those off the western end of Kakeroma sima, is 80 ft. high, and the rock half a mile to S.S.W. is 13 feet high.

Ioro or *Yoro sima* is 980 ft. high, and *Uke sima* 1,294 feet.

Page 1149.—**Kikai ga sima**, 12½ miles S.E. of the N.E. end of Amami O sima, is 7½ miles in extent N.E. and S.W., and from 1½ to 3½ miles in width, rising to an elevation of 684 feet. It has over 15,000 inhabitants, and a telegraph cable from Akaogi is landed on its N.W. side. There are but few trees on the island, but it produces the best sugar and mats made in the Lu-chu Islands.

The only reef found around the S.W. and S.E. ends of Kikai ga sima, during the Japanese survey, and the only one known to the local fishermen, was *Ogame Reef*, of 2½ fathoms, lying 3 miles off the southern extreme, with the summit bearing N.E. ¾ E. This must be the same as *Germantown Reef*.

Marsh Reef is also considered not to exist, a thorough search having been made for it by Japanese officers in 1907, and no bottom found at from 100 to 150 fathoms in and around the given position.

Hesper Island and *Tabiyo saki Island* have been removed from the chart, not having been found when searched for by Japanese officers.

In 1891, Capt. C. F. Barstow, ship *Granite State*, reported having sighted a small flat-topped island from a distance of 12 or 15 miles, lying in about lat. 28° 26′ N., long. 130° 21′ E., and this also was searched for in vain.

TOKU NO SIMA, or Kakirouma, is about 14 miles in extent, well wooded, and produces considerable quantities of sugar. A telegraph cable is landed at the junk harbour, 3 miles southward of Cape Ototsino. *Toksima Rocks* lie 2 to 3 miles off the N.E. point.

Iwo sima, Tori sima, or *Sulphur Island*, on which is the southernmost active volcano of the Lu-chu Islands, is about 2 miles in extent North and South.

Pages 1149-1150.—**Oki no Erabu**, or *Yerabu sima*, is inhabited, and connected with the Japanese telegraph system.

Page 1150.—**Yoron jima**, or *Yori sima*, is about 3 miles in diameter, its summit being charted in lat. 27° 3½′ N., long. 128° 25½′ E.

OKINAWA SIMA, or Great Lu-chu Island, derives its latter name from Chinese characters denoting a floating dragon, which its irregular shape somewhat resembles, varying from 1½ to 8 miles in width, and 59 miles in extent, being the largest and most important of the Lu-chu Islands. Its northern part, known as *Kunchan* or

Yambara, is mostly mountainous and barren, and but sparsely inhabited, attaining a maximum elevation of 1,622 feet. The southern part consists of open rolling country with low hills, well cultivated, and thickly populated, much resembling typical English scenery. The population numbers upwards of 350,000, and it is connected with the Japanese telegraph system.

Pages 1150-1153.—**NAHA, or Nafa**, is the port of entry for the Lu-chu Islands, being the seat of the Japanese administration. The town contains about 27,000 inhabitants, and is connected with *Shuri*, 3¼ miles inland, by a good broad road, hitherto the only one in the islands. Roads are also being made thence to Nago, the principal town in the northern part of the island, and to the village of Yunabaru on the eastern coast. Three lines of steamers from Japan visit the port regularly, and it is connected with the telegraph system.

Page 1150.—**Reef Islands.**—*Green Islet*, the easternmost, is 37 ft. high, and lies 4¾ miles N.W. ½ W. from the lighthouse on Abbey Point; it lies close eastward of *Kamiamah*, both islets being situated on the same reef. *Nagandu*, the western island, is 20 ft. high, occupying the eastern part of an atoll reef about 2 miles in diameter. *Chee*, the southern islet, is only 7 ft. high. The reefs surrounding these islands are steep-to.

Sakibaru saki, or *Abbey Point.—Ufunmi yama*, or *Wood Hill*, is 121 ft. high.

The LIGHTHOUSE on Sakibaru saki is a round white brick tower 40 ft. high, showing a *flashing* light every 15 *seconds*, at 92 ft. above high water, visible 14 miles; *red* over Rukan se and Reef Islands from S. 34° W. to N. 27° W.; *bright* over the safe approach from N. 27° W. to N. 10° W.; *green* over the outer reefs between N. 10° W. and N. 29° E.; *bright* from N. 29° E. to N. 48° E. over the anchorage; *red* from N. 48° E. to S. 80° E.; and obscured elsewhere.

Naha Light.—On Fort Miyegushiku, on the North side of the entrance to the junk harbour, stands a white turret showing a *fixed* unwatched light, elevated 30 ft., and visible 6 miles; *red* over South Channel between West and N. 57° W.; *bright* towards Green and Kamiamah Islets, over the direct approach to the junk harbour, between N. 57° W. and N. 52° W.; *red* over the outer reefs between N. 52° W. and N. 13° E.; and obscured elsewhere.

Page 1151.—*Ingersoll Patches* were unsuccessfully searched for during the Japanese survey, in 1893.

Mount Onnodake, in lat. 26° 28½′ N., is 1,270 feet high.

Naha inner or junk harbour has depths of 9 to 12 ft., the entrance passing between the two forts.

Page 1152.—It is high water at Naha, on full and change, at 7h. 4m.; springs rise 7¾ feet.

Directions.—The approach by night is simplified by the lights exhibited on Iye sima and at Naha, but a stranger would scarcely attempt to enter the harbour by night.

Oar Channel, or *Karafune guchi*, is recommended as the best channel for vessels entering Naha harbour. Nanganni yama, seen between the forts at the entrance to the junk harbour, bearing S.E. ½ E., leads in until Sakibaru saki lighthouse bears S. by W., when gradually alter course to N.E. by N. with the lighthouse astern, and anchor in 15 to 12 fathoms.

Page 1153.—**The Coast** northward of Naha is well inhabited and forms a deep bay, the shores fringed with reefs fronted by off-lying dangers in places. *Zan Pa misaki*, or *Cape Broughton*, is 14 miles northward of Naha, and hence the coast trends E.N.E. for 17½ miles, and then turns W.N.W. towards Suco Island 7½ miles farther on.

Nago wan, or *Deep Bay*, has the town of *Okaneku* or *Nago* at its head.

Sesoko sima, or *Suco Island*, has anchorage in 5 to 10 fathoms, sand, good holding ground, eastward of it. The narrow channel at its N.E. end has about 4 fathoms between the reefs on either side. *Menna jima*, 39 ft. high, lies 2 miles westward of Sesoko, and is surrounded by a fringing reef. *Gibson Reef* is a small detached patch 1¼ mile northward of Menna.

Pages 1153-1154.—**IYE SIMA and Light.**—Iye sima lies 2½ miles westward of *Bise saki* or *Cape Niofa*, there being a deep clear channel 1½ mile wide between the reefs on either side. The peak near the eastern end of Iye is 555 ft. high. On the western end of the island stands an iron tower 100 ft. high, painted in black and white bands, showing a *revolving bright* light every *half-minute*, elevated 167 ft., and visible 19 miles seaward between S. 45° E. and N. 64° E.

Untenko, *Port Oonting* or *Melville*, is the best harbour around Great Lu-chu, but is of no commercial importance. It is high water, on full and change, at 7h. 36m.;

springs rise 7¼ feet. There are depths of 8 to 9 fathoms, mud, at the anchorage off the village, but there are patches of 2½ to 3 fathoms in the approach.

Shana wan, or *Shah Bay*, is 5½ miles eastward of Unten ko, and hence the coast trends 15 miles N.E. by N. to *Hedo saki* or *Cape Heto*, its southern part fronted by wide reefs and off-lying patches.

Chim wan, or *Barrow Bay*, is 2½ miles wide at its entrance, and is 8 miles in extent north-westward of the *Banare Islands* and their connecting reefs, which bound it on the S.E. The greater part is encumbered with reefs and detached patches, but the northern part is clearer, and the Japanese survey shows anchorage in 14 fathoms, mud, about three-quarters of a mile off the northern shore.

Tsuken or Tsuchi jima and Light.—A broad belt of reefs extends southward from Banare Islands, and on the southern lies Tsuken jima, on the South point of which stands a white iron tower 41 ft. high, showing a *fixed* light at 76 ft. above high water, visible 14 miles; *bright* seaward between N. 52° E. and S. 10° E., over the safe approach to Naka gusuku wan; *red* over the outer reefs between S. 10° E. and S. 60° W.; *bright* over the fairway of the bay towards Yunabaru, between S. 60° W. and N. 88° W.; and obscured elsewhere.

Naka gusuku wan, or *Mathews Bay*, is 2¼ miles wide at its entrance between Tsuken jima and the reefs to the southward, and forms a basin about 10 miles in diameter within the off-lying islands and reefs. *Chikuniga* is a detached patch of 10 ft. water lying in the middle of the fairway about 2 miles within the entrance, but otherwise the Japanese survey shows depths of 10 to 20 fathoms over the central part of the bay. The northern part is much encumbered with reefs but there is a clear area north-westward of Tsuken jima, named *Katchin wan*, with anchorage in 9 to 10 fathoms. In the western angle of the bay is the village of *Yunabaru*, before mentioned (see Addenda for pages 1150-1153).

The South end of Great Lu-chu has a narrow fringing reef, with deep water close outside, but between *Chamsaki* (or *Cape Yakimu*) and Naha Harbour the coast is fronted by a wide reef with off-lying patches.

Rukan se, or *Halls Breakers*, is a dangerous reef about a mile in diameter, with 20 to 30 fathoms close around.

Huber Reef has been searched for in vain in the assigned position, and the fishermen know nothing of it. In 1905, the Japanese officials found depths of 41 to 45 fathoms hereabout.

Page 1155.—**KERAMA ISLANDS** lie over an area 13½ miles in extent East and West, by 8 miles North and South at their western end. Among them are a few detached reefs, but the Japanese survey shows deep water in the channels between the principal islands.

Mae jima, or *Maikirima*, is 449 ft. high, and has conspicuous white cliffs on its eastern side. *Cone Islet* is 203 ft. high.

Kuro or *Koru sima*, or *Saddle Island*, 2¾ miles N.W. of Mae jima, is 428 ft. high.

Zamami sima has a small bay on its S.E. side, at the head of which is *Ago no ura*, the principal village and port of the group.

Page 1156.—*Moru sho*, or *Mole Reef*, has its North end at a mile westward of the South point of Kerama sima, and thence extends a mile to S.S.W. *Abokiamu sho*, or *Whale Reef*, is 2½ miles S. by W. from Kerama.

Shimo ze is a dangerous rocky pinnacle of 3 fathoms, lying 3¾ miles S.W. ⅛ S. from Kerama sima.

Tokashiki rises to an elevation of 775 ft. at its N.E. end.

Tonaki jima, or *Tunashee*, lies 9¼ miles N.W. by N. ½ N. from Yakabi or Yakang.

KUME JIMA, or Komisang, 18 miles West of Tonaki, is thickly populated, and a much prized silk fabric is manufactured here. *Kana gusuku hama*, the principal village, is situated on the S.W. coast. There is a fine waterfall visible from sea.

Tori or *Tu sima* is 13¾ miles N.N.E. of the North peak of Kume.

Akuni jima, or *Agunyeh*, is 12 miles N. by E. ½ E. from Tonaki.

Ihiya jima, or *Yebiya sima*.—A rock awash lies 1½ mile to the W.S.W. of *Jabo*, which lies on the reef extending off the S.W. end of Ihiya.

Yanagi Islet lies about 11½ miles N. by E. from Bise saki, the N.W. extreme of Great Lu-chu.

Page 1157.—**MEIACO SIMA ISLANDS** are collectively named *Saki sima* (meaning "farther islands") by the Japanese, the names formerly used being Chinese, and they are under the political administration of Lu-chu; the people much resemble those of that group, the total population numbering about 55,000. Some of the islands have

fine forests, and much tobacco is grown. The climate is very wet and unhealthy malaria being prevalent. There is regular communication by steamer with Naha, and there is telegraphic communication with Formosa and Japan.

Navigation is rendered dangerous by the extensive coral reefs around these islands, and, as the sunken patches are usually overgrown with seaweed, they are not always easy to make out. There are no good harbours.

During the season of the S.W. monsoon south-easterly winds may be experienced, and north-easterly winds towards the end.

YONAKUNI JIMA, or Kumi Island, the westernmost of the group, is about 6 miles in extent East and West, and 700 ft. high. It is well populated, *Sonai*, the principal village, being on the North side, in an inlet only accessible to junks.

In 1906, the steamer *Aberlour* passed over the position of the reported *dangerous shoal* about 10 miles N.W. by W. from Yonakuni, and no signs were seen of it.

Boudrouet Rocks were not seen from the steamer *Tsukishima maru*, in 1899, though a careful look-out was kept, nor were they seen from the U.S.S. *Yorktown* in 1901.

The YAEYAMA GROUP, formerly known as Pa chung san, embraces the islands of Iri Omote jima and Ishigaki jima with the surrounding smaller islands, all inhabited, the population numbering about 15,000.

Page 1158.—**IRI OMOTE JIMA,** known to the Chinese as *Ku kien san*, rises to a greatest elevation of about 1,450 ft., and is mostly covered with dense forest. Coal, of poor quality, is found on the island, and was at one time mined, but the deadly climate stopped the work.

Port Herbert is a deep inlet on the N.W. side of Iri Omote, and on the N.E. side of the entrance is the principal village of *Sonai*. Detached reefs lie in the fairway of the entrance. The telegraph cables are landed on the western side of the entrance.

Port Cockburn, or *Funauke ko*, is another deep inlet close south-westward of Port Herbert, with deep anchorage near its head.

Seymour Bay, or *Kanokawa wan*, on the South coast near the western end, has a sunken reef near its centre.

Hatoma sima is 117 ft. high.

Haderuma sima, or *Hasyokan*, the southernmost island of the Lu-chu group, is 220 feet high. *Okino Kami jima*, or *Chung chi*, 14 miles to N.W. ½ W., is a small narrow island 300 ft. high.

Loney Island is known to the Japanese as *Shimo sima* or *Ara gusuku; Inglefield Island* as *Kami jima* or *Shi jo Kami hi; Baugh Island* as *Kuro sima; Roberton Island* as *Taketomi jima;* and *Koubah* as *Kobama jima*.

ISHIGAKI JIMA, or Pa chung san of the Chinese, is about 11 miles in extent N.W. and S.E., with a long narrow arm reaching about 10 miles north-eastward. Its northern part is hilly, rising to an elevation of 1,680 ft. at *Omoto dake*, and a peak near the N.E. end to 1,115 feet. The southern part is comparatively level, and highly cultivated with sugar, indigo, &c. *Ishigaki*, the principal village, is on the S.W. coast.

Miyara wan, or *Broughton Bay*.—The break in the reefs is only about 1½ cable in width, with depths of 7 to 16 fathoms.

Hirakubo saki, or *Adams Point*, is now charted in lat. 24° 36½′ N., long. 124° 18¾′ E. *Tarara Islet* is known to the Japanese as *Tarama*. In the year 1897, the captain of the steamer *Owari maru* reported having struck on a sunken rock lying about 3 miles north-westward of *Minna jima* (or *Mitsuna*), and breakers extended half a mile north-westward from that position. In 1896, the captain of the steamer *Ryusei maru* reported having seen breakers about 3 miles N.E. by E. ½ E. from Minna jima.

Page 1159.—**NAKURA WAN, or Port Haddington.**—The telegraph cables are landed within *O saki* or *Hamilton Point*, whence another cable extends across to the southern shore, in connection with the village of Ishigaki.

Page 1160.—**MIYAKO JIMA, or Tai pin san** of the Chinese, is 17 miles in extent N.W. and S.E., by 6 miles in greatest width, and rises to an elevation of 378 feet. It is thickly populated, this and the surrounding islands containing about 35,000 inhabitants. There is not much timber on these islands and fresh water is often scarce. No supplies could be obtained.*

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* YKIMAH ISLAND has been removed from the chart, many passing the reported position having seen nothing of it. In 1906, no bottom was found at 290 fathoms from the U.S.S. *Yosemite* hereabout.

Kuruma jima, or *Kurimah*, off the S.W. side of Miyako jima, appears to be fronted by reefs extending 2 or 3 miles off, and so continuing towards *Shimoji sima* and *Erabu* or *Yerabu sima*, the latter being 302 ft. high.

Between Erabu sima and the N.W. part of Miyako jima is *Karimata Bay*, so named from the principal village, and the only harbour of the island. *Ikema sima*, or *Coruma*, lying off the N.W. extreme of Miyako jima, is 113 ft. high. *Hummock Island* is known to the Japanese as *Ogami jima*, and *Providence Reef* as *Yaye bise*.

Uranus Reef.—In 1869, the captain of the barque *Uranus* reported seeing a breaking shoal about a mile in circumference, with several rocks 8 to 10 ft. high on its S.E. side, lying in about lat. 24° 24′ N., long. 126° 0′ E., or about 33 miles south-eastward of Miyako jima. Nothing more is known of it, and it has been removed from the chart.

Page 1162.—**HOA-PIN-SU** is now charted in long. 123° 28½′ E., lying 94 miles E.N.E. of Petu Point, the N.E. extreme of Formosa, and 84 miles N.W. by N. ¼ N. from Hirakubo saki, the N.E. extreme of Ishigaki jima.

Page 1163.—**Ti-a-usu** is charted in lat. 25° 57′ N.

Page 1166.—**WINDS, etc.**—Methodical observations are still far from sufficient to give much more than a general idea of the meteorology of the Pacific Ocean. The following information, derived from various recent sources, will be found useful in connection with what is already given in the Directory.

Pages 1167-1169.—**TRADE WINDS.**—The great increase in traffic across the Pacific Ocean has led to a corresponding increase of our knowledge of the meteorology of the more central region. The United States Hydrographic Office has collected and tabulated the observations contained in the logs of a large number of vessels, and from this source we have compiled the following Table, which shows clearly the average limits of the Trade Winds, and the breadth of the intervening belt of calms and variable winds, over the eastern part of the Ocean. In this region the calm belt is always North of the Equator, so that, with the exception of the Southern Limit of the S.E. Trade, the parallels given are in North latitude.

If this Table be compared with that given on page 371 of the Addenda for Findlay's "South Pacific Directory," considerable discrepancies will be found. The Table here given is compiled from more recent sources.

Limits of Trade Winds.	80° W.	90° W.	100° W.	110° W.	120° W.	130° W.	140° W.	150° W.	160° W.	170° W.	180°
January	°	°	°	°	°	°	°	°	°	°	°
N. Limit, N.E. Trade ...	...	...	...	...	22½	28¼	27½	24½	24	24½	24½ N.
S. „ „ „	...	...	...	8	9	7¾	6	5	3¾	3	2½ N.
N. „ S.E. „	...	...	4	4	5	4½	4	3	2	1½	1 N.
S. „ „ „	28½	29	26	20	29	24½	...	24	31½	25	... S.
February											
N. Limit, N.E. Trade ...	...	...	...	21¾	27	28¾	29½	27¾	25	22½	21¼ N.
S. „ „ „	...	5¾	5¾	5¾	7¾	7	5⅝	4⅝	3½	2⅜	1⅝ N.
N. „ S.E. „	...	1¾	2¼	3¼	4¼	4	3¼	2¼	0¾	...	... N.
S. „ „ „	30	28½	23	15½	25½	30	...	26	28	...	33 S.
March											
N. Limit, N.E. Trade ...	...	...	...	17½	23¼	28¼	27¾	25¾	24½	23¼	22¾ N.
S. „ „ „	...	7	4	3¾	4½	4¼	3½	2¾	2	1½	1 N.
N. „ S.E. „	...	...	0½	1¾	2½	2	1½	1¼	0¾	0	... N.
S. „ „ „	27½	27½	24	15	22	23½	...	24½	20	24½	... S.
April											
N. Limit, N.E. Trade ...	...	11¼	13	17½	24½	29	30¾	29¾	29	28¾	27¾ N.
S. „ „ „	...	7	5½	6¾	6½	6	5	4½	3¾	3	2¼ N.
N. „ S.E. „	...	0	1½	3	3½	3¼	3	2½	1¾	0¾	... N.
S. „ „ „	27	26½	25	18	26½	25½	...	18½	24	32	33 S.
May											
N. Limit, N.E. Trade ...	...	...	...	...	24½	29¾	30½	32	...	...	... N.
S. „ „ „	...	...	...	9	8¼	6½	6	6½	...	...	... N.
N. „ S.E. „	...	...	...	5	3¾	...	...	...	...	...	... N.
S. „ „ „	25	24	20½	18½	20	23	...	16	28	26	... S.
June											
N. Limit, N.E. Trade ...	...	...	...	...	24¾	30	32¾	32½	32½	31	28½ N.
S. „ „ „	...	...	...	...	10½	10	7¾	6½	6	...	... N.
N. „ S.E. „	...	...	...	4¼	6¼	7	6	5	4¼	...	... N.
S. „ „ „	19	24½	23	24	22	25	...	19	23½	26	... S.
July											
N. Limit, N.E. Trade ...	...	...	...	...	...	33¼	34¼	33½	33¼	33¼	34 N.
S. „ „ „	...	...	...	13¾	14½	13¼	11	9	7¼	...	... N.
N. „ S.E. „	...	...	...	6	6¾	6¾	6¾	7	4¾	. .	... N.
S. „ „ „	28	27	21	24½	26	21½	...	17½	20	27	27 S.
August											
N. Limit, N.E. Trade ...	...	...	...	...	...	32	33½	37¼	33	...	... N.
S. „ „ „	...	...	...	11	13¾	12¼	12½	9	7½	...	... N.
N. „ S.E. „	...	...	...	4	6¾	8	7¼	5¾	3	...	... N.
S. „ „ „	28½	24½	23½	18½	18	25	...	18	26	25	28½ S.
September											
N. Limit, N.E. Trade ...	...	...	...	...	27¼	30¼	33½	32	31½	32	... N.
S. „ „ „	...	...	...	...	14¼	15	10½	10	10	...	... N.
N. „ S.E. „	...	...	...	4¾	7	8	8½	5	5½	...	... N.
S. „ „ „	21	23	23½	22	19½	23	...	18½	24½	26	... S.
October											
N. Limit, N.E. Trade ...	...	...	...	...	23¾	28¼	33	30¼	30¾	...	... N.
S. „ „ „	...	...	...	...	12	11½	11	8	7	...	... N.
N. „ S.E. „	...	...	2	4¼	5½	6¾	5	3	0	...	... N.
S. „ „ „	26	27½	24	22	23	24	...	20	23½	26	25½ S.
November											
N. Limit, N.E. Trade ...	...	...	...	...	26½	28	32¾	28	24¾	...	... N.
S. „ „ „	...	...	...	8¼	10	10¼	8¾	9¼	8	...	... N.
N. „ S.E. „	...	...	...	3¾	6¼	5½	4¾	6	3¾	...	... N.
S. „ „ „	30½	28½	24	21	19	22½	...	21½	24	24	... S.
December											
N. Limit, N.E. Trade ...	...	...	...	...	25¼	29	28½	26	24	...	... N.
S. „ „ „	...	...	...	8¼	9¾	7¼	7	6¾	2¾	...	... N.
N. „ S.E. „	...	...	...	5	5¾	5	6	...	...	...	... N.
S. „ „ „	29	29	29	23	21	25½	...	24½	23½	29½	33 S.

In addition to this we give the general information shown on the Pilot Chart of the North Pacific Ocean, issued monthly by the United States Hydrographic Office, to which the reader is referred for fuller details.

January.—In this month the N.E. Trade blows freshest and steadiest, with an average force of 4·5 to 5, in two regions between the parallels of 10° and 20° N., viz., between long. 115° and 150° W., and between 130° and 155° E.

Between 5° and 10° N., the N.E. Trade prevails from the American coast to 115° W., veering to easterly between 115° and 140° W., and again from the N.E. beyond 140° W.

Between the Equator and 5° N., the S.E. Trade prevails from the American coast to 135° W., and thence to 170° W. the prevailing winds are easterly.

From 170° W. to 120° E., the N.E. Trade is continuous from the Equator to 20°—25° N., the calm belt being South of the Equator between these meridians.

In Honolulu, the N.E. Trade blows on an average 14 days in January.

The region of most frequent calms and light winds in mid-ocean is between 20° and 25° N., and 170° W. and 175° E., average force below 3·5.

February.—To the eastward of 150° W., except near the Equator, the wind is generally N.E., inclining eastward beyond this meridian, and again becoming N.E. as the Equator is approached in East longitude. Between 140° W. and 140° E. the N.E. Trade blows freshest and steadiest between 5° and 15° N., the average force varying between 4·2 and 3·6.

In Honolulu, the N.E. Trade blows on an average 15 days in February, but westward of the Hawaiian group the Trade is often supplanted by south-westerly winds.

Tedious calms, often lasting several days, will be found between the Equator and 10° N., long. 180° and 120° E.; also over a triangular area the base of which extends from Cape San Lucas to Panama, the vertex being in lat. 5° N., long. 130° W.

March.—Eastward of 180°, the direction of the wind becomes more northerly as far as 125° W. Between 140 W. and 140° E., the N.E. Trade blows freshest and steadiest between 5° and 15° N., with an average force of about 4.

In Honolulu, the N.E. Trade blows on an average 17 days in March. Westward of the Hawaiian group, between 20° and 25° N., the Trade is often supplanted by south-westerly winds.

Frequent calms, with light northerly and north-westerly winds, will be experienced in the region between the Equator and 5° N., westward of 140° E. Calms are also frequent near the Marshall Islands, and over the triangular area described in February.

April.—The direction of the N.E. Trade will vary from N.N.E. along 125° W. to East in mid-ocean, again inclining toward N.E. as the Equator is approached westward of 180°. Between 140° W. and 140° E., the Trade blows freshest and steadiest between 5° and 15° N., with an average force of 4·2 to 4·4.

In Honolulu, the N.E. Trade blows on an average 21 days in April.

Calms and light variable airs are frequent between the Equator and 10° N., long. 180° and 130° E.; also over the triangular area described in February.

May.—The direction of the N.E. Trade will vary from North along 125° W. to East in mid-ocean, the Trade blowing freshest and steadiest over much the same area as in April.

In Honolulu, the N.E. Trade blows on an average 24 days in May.

Calms and light airs are frequent between the Equator and 10° N., long. 180° and 130° E.; also over the triangular area between Cape San Lucas and the Gulf of Panama, with the vertex in lat. 10° N., long. 125° W.

June.—The N.E. Trade blows much as in May, but is freshest and steadiest between 10° and 15° N., between 140° W. and 140° E., with an average force of 4·3.

In Honolulu, the N.E. Trade blows on an average 26 days in June.

Calms and light airs are frequent over the same areas as in May, but the vertex of the triangular area in June is in 10° N., 130° W.

July.—The N.E. Trade will vary from North along 125° W. to East in mid-ocean. Between 140° W. and 140° E. it blows freshest between 10° and 15° N., with an average force of about 4, but the belt of greatest frequency of easterly winds is between 15° and 25° N.

In Honolulu, the N.E. Trade blows on an average 29 days in July.

Tedious calms are frequent over the region between the Equator and 10° N., long. 180° and 130° E.; also over the triangular area as described in February.

August.—The N.E. Trade will vary between North along 125° W. and East in mid-ocean. Between 140° W. and 140° E. it blows freshest and steadiest between 15° and 20° N., with an average force of 3·4.

In Honolulu, the N.E. Trade blows on an average 30 days in August.

Tedious calms are frequent over the same regions as in February.

September.—The N.E. Trade will blow much as in August.

In Honolulu, it blows on an average 26 days in September.

Tedious calms are frequent over the same regions as in February.

October.—The N.E. Trade will vary in direction between N.N.E. along 125° W. and E.N.E. in mid-ocean, blowing freshest and steadiest as in August.

In Honolulu, it blows on an average 22 days in October.

Tedious calms are frequent over the same regions as in February.

November.—The N.E. Trade will vary from N.E. along 125° W. to E.N.E. in mid-ocean, blowing freshest and steadiest over the same region as in June, with an average force of 3·8.

In Honolulu, it blows on an average 18 days in November.

Tedious calms are frequent over the same regions as in February.

December.—The N.E. Trade will vary from N.E. along 125° W. to East in mid-ocean, blowing freshest and steadiest over the same region as in June, with an average force of 4·2.

In Honolulu, it blows on an average 18 days in December, but westward of the Hawaiian group, between 20° and 25° N., it is often supplanted by south-westerly winds.

Capt. M. W. C. Hepworth, in a paper read before the Royal Meteorological Society, 1900, remarked that on the steam route between Juan de Fuca Strait and Honolulu it is usual to find the first indication of the expected N.E. Trade to be a long swell from the N.E. though the winds may have been westerly, and this has been experienced for as much as 300 miles before the Trade wind was felt. He also gave the following information as the result of his experiences on many voyages between British Columbia and Australia, viâ Hawaii and Fiji :—

In January, February, and March moderate Trades, with occasional showers, may be expected from 20° N. to the Equator; thence lighter N.E. winds to 5° S. In April, May, and June, the limits of the N.E. Trade appear to be between 24° N. and 2° N., but N.E. winds also then prevail, with rain, as far as 5° S. In July, August, and September, the N.E. Trade is first met with in about 25° N., and extends South of the Equator, merging into the S.E. Trade without interruption. In October, November, and December the N.E. Trade extends from about 30° N. to 3° N., near which parallel the S.E. Trade will be met.

TROPICAL VARIABLE WINDS.—Between the northern limit of the N.E. Trade and the southern limit of the Anti-trades, or approximately between the parallels of 20° and 30° N., is a region of high barometer, with variable winds, sharp squalls, and calms, most baffling to sailing vessels, which should keep clear of it. This region, known as the *Calms of Cancer*, does not, however, extend the whole breadth of the ocean; for northerly winds will be experienced for 10° or 12° westward of the American coast, and on the western side of the ocean the alternating monsoons extend as far North as 30° N.

In a Paper read before the Shipmasters Society, London, in 1895, Mr. W. Allingham describes this area as roughly elliptical in form, the major axis extending along the parallel of 30° N. as far as 160° E. for nine months of the year, and to 170° W. for the remaining three months, varying in width with the seasons. Vessels bound to California, Oregon, &c., will make the quickest passages from the Equator by skirting the western portion of this area.

Page 1169.—**The S.W. ANTI-TRADE WINDS** prevail over the area northward of about lat. 35° N., their strength and persistency being somewhat dependent upon the varying positions of the permanent area of high barometric pressure off the Californian coast, and that of low pressure near the Aleutian Islands. They are, however, often interrupted by cyclonic and anti-cyclonic disturbances moving eastward across the ocean, and blow less strongly in the summer months. The following general particulars are gained from the U.S. Pilot Chart of the North Pacific Ocean (see Addenda for pages 1167-1169).

January.—Northward of lat. 30°, the prevailing winds are north-westerly over the western half of the ocean, and south-westerly over the eastern half. Half the recorded observations show a force of 5 or over, and a third of 6 or over, between 35° and 50° N., 125° W. and 145° E.

Gales (force 8 and over) increase in frequency from the Equator to about 40° N., and thence decrease northward. They are most frequent (20 to 25 per cent. of all wind observations) along 40° N., between 170° W. and 155° E.; and in the eastern part of the ocean (10 to 15 per cent.) between lat. 40° and 50° N.

February.—Easterly winds, between North and S.S.E., are most frequent (66 per cent.) between 25° and 30° N., long. 140° W. and 180°, decreasing in frequency farther northward. Westward of 180°, westerly winds, between South and N.N.W., are most prevalent (68 per cent.) between 25° and 30° N., and (76 per cent.) between 45° and 50° N.

Gales are not so frequent as in January, mostly (26 per cent.) between 30° and 35° N., 150° and 170° E., and (20 per cent.) between 35° and 40° N., 180° and 150° E.

March.—Winds between North and S.S E. are most frequent (67 per cent.) between 25° and 30° N., 140° W. and 180°, decreasing in frequency, northward of 30° N., to 31 per cent. between 45° and 55° N. Winds between South and N.N.W. prevail across the ocean between 30° and 50° N., the greatest frequency (66 per cent.) being between 40° and 45° N., westward of 180°.

Gales are less frequent than in February, mostly (10 per cent.) between 45° and 50° N., 125° W. and 150° E.

April.—Winds between North and S.S.E. are most frequent (78 per cent.) between 25° and 30° N., 140° W. and 180°, and 69 per cent. westward of 180°, decreasing gradually northward of 30° N. Winds between South and N.N.W. prevail across the ocean between 35° and 55° N., being most frequent (69 per cent.) between 45° and 50° N., 140° W. and 180°.

Gales are less frequent than in March, mostly (8 per cent.) between 45° and 50° N., 125° W. and 150° E.

May.—Winds between North and S.S.E. are most frequent (79 per cent.) between 25° and 30° N., 140° W. and 180°, and 58 per cent. westward of 180°, decreasing gradually northward of 30° N. Winds between South and N.N.W. prevail across the ocean between 40° and 55° N., being most frequent (76 per cent.) between 40° and 45° N., 140° W. and 180°.

Gales are less frequent than in April, mostly (5 per cent.) between 40° and 50° N., 125° W. and 150° E.

June.—Winds between North and S.S.E. are most frequent (81 per cent.) between 25° and 30° N., 140° W. and 180°, and 55 per cent. westward of 180°. Winds between South and N.N.W. are more prevalent eastward of 180°, being most frequent (62 per cent.) between 45° and 50° N.

Gales are seldom experienced, mostly (3 per cent.) between 45° and 50° N., 125° W. and 150° E.

July.—In this month the westerly winds (between South and N.N.W.) are not so persistent, their greatest frequency (60 per cent.) being between 45° and 50° N., 140° W. and 180°. Winds between North and S.S.E. prevail across the ocean, being most frequent (63 per cent.) between 35° and 40° N., 140° W. and 180°, and 62 per cent. westward of 180° between 45° and 50° N.

Gales are very seldom experienced, mostly (3 per cent.) between 40° and 50° N., 180° and 160° E.

August.—Winds between North and S.S.E. are most frequent across the ocean between 35° and 45° N., mostly (79 per cent.) between 35° and 40° N., 140° W. and 180°, and 60 per cent. westward of 180°. Winds between South and N.N.W. are most prevalent between 45° and 55° N., mostly (64 per cent.) between 50° and 55° N., eastward of 180°.

Gales are still infrequent, mostly (3 per cent.) between 40° and 50° N., 180° and 160° E.

September.—Winds between North and S.S.E. are most frequent between 35° and 45° N., mostly (66 per cent.) between 140° W. and 180°, and 60 per cent. westward of 180°. Winds between South and N.N.W. are more prevalent between 45° and 55° N., mostly (63 per cent.) between 140° W. and 180°, 50°, and 55° N., decreasing in frequency southward of 50° N.

Gales are more frequent, mostly (6 per cent.) between 45° and 50° N., 125° W. and 150° E.

October.—Westerly winds (between South and N.N.W.) prevail over the northern part of the ocean, being most frequent (75 per cent.) between 45° and 50° N., 180° and 145° E., and 71 per cent. eastward of 180°. Winds between North and S.S.E. are most frequent (51 per cent.) between 35° and 40° N., 180° and 145° E.

Gales increase in frequency, mostly (10 per cent.) eastward of Formosa and the Philippines, and 7 to 8 per cent. between 40° and 50° N., 125° W. and 150° E.

November.—Westerly winds (between South and N.N.W.) prevail over the northern part of the ocean, being most frequent (70 per cent.) between 50° and 55° N., 180° and 160° E., and 66 per cent. between 140° W. and 180°, 40° and 45° N. Winds between North and S.S.E. are most frequent (48 per cent.) between 35° and 40° N., westward of 180°, and 44 per cent. eastward of 180°.

Gales are more frequent than in October, mostly (13 per cent.) between 45° and 50° N., 125° W. and 150° E.

December.—Westerly winds (between South and N.N.W.) prevail over the northern part of the ocean, and are stronger than in January, being most frequent (75 per cent.) between 40° and 45° N., 140° W. and 180°, and 65 per cent. westward of 180°. Winds between North and S.S.E. are most frequent (40 per cent.) between 50° and 55 N., 140° W. and 180°, and 39 per cent. westward of 180°.

Gales are mostly (16 per cent.) met with between 45° and 50° N., 125° W. and 150° E., and 13 per cent. between 40° and 45° N.

CYCLONES.—Around a cyclonic area of *low* barometer the winds circulate in the opposite direction to the hands of a watch. Its approach is heralded by damp weather, a falling barometer and rising thermometer, gathering clouds cirrus and nimbus, and the general direction of the winds is equatorial or easterly. The disturbance travels eastward, accompanied by gales and rain, and the centre is generally northward of the parallel of 35°.

ANTI-CYCLONES.—Around an anti-cyclonic area of *high* barometer the winds circulate in the same direction as the hands of a watch. Its approach is foretold by dry weather, a rising barometer and falling thermometer, clouds tend to disappear, and the general direction of the winds is polar or westerly. Its eastward passage is accompanied by light winds and fair weather.

STORMS are not met with in the Equatorial belt between 5° N. and 9° S., and are rarely encountered in the region of the N.E. Trade between 130° W. and 145° E.

Pages 1172-1174.—**The Mexican Belt of Calms.**—The monthly limits of this region of calms and light variable winds are given in the Addenda for pages 1167-1169. Its area is triangular in form, the base extending from Cape San Lucas to the Gulf of Panama, and the vertex in long. 120° to 125° W., lat. 5° to 15° N., being most northerly in summer. These calms are most persistent nearer the coast, though immediately under the coast the prevalence of land and sea breezes enables sailing vessels to make a tedious passage northward or southward.

In addition to what has been stated in the Addenda for pages 83-84, as to the cyclonic storms known as *Cordonazos de San Francisco*, observations show that they occur most frequently in September and October. The storm area is rarely over 200 miles in diameter, and they seldom attain the full force of a hurricane. The path of the storm is usually in a direction between N.W. and S.W., except in the immediate vicinity of the coast, where it may travel eastward of North; its average velocity does not exceed 10 miles an hour.

Page 1174.—**Lower California, &c.**—See the Addenda for pages 128-129 and 130.

WINDS along the AMERICAN COAST.—The following general remarks are derived from the monthly U.S. Pilot Chart of the North Pacific Ocean.

January.—Between 10° and 15° N., northerly winds prevail near the coast, becoming north-easterly beyond 95° W. Southward of 30° N., as far as Acapulco, north-westerly winds may be expected within 300 miles of the coast. Between the Equator and 15° N., as far as 100° W., the average force is less than 3; also along a belt for 400 to 500 miles off shore between 15° and 30° N.

Between 30° and 40° N., the winds are more variable than farther North, with a tendency to north-westerly near the coast. Between 40° and 45° N., southerly winds prevail near the coast, varying to S.W. by W. between 125° and 130° W., and to N.W. between 130° and 135° W. Between 45° and 50° N., south-easterly winds prevail near the coast, becoming S.W. beyond 130° W.; frequent gales from the southern semicircle will be met between 125° and 130° W. Between 50° and 55° N., the prevailing winds are south-westerly.

Fog may be met with northward of 25° N.

February.—Between the Equator and 5° N., south-westerly winds prevail eastward of 90° W., westward of which the direction becomes southerly and then south-easterly. Between 5° and 15° N., north-easterly winds prevail, reaching as far West as 105° W. between 5° and 10° N., becoming easterly beyond. Between Acapulco and 30° N., north westerly winds prevail within 300 miles of the coast.

Between 30° and 40° N., the wind varies from N.W. near the coast to N.E. beyond 130° W., and gales from West to North occasionally. Between 40° and 45° N., the wind will set in from South with a falling barometer, veering to North when it rises, blowing longest and strongest from S.W. Northward of 45°, under similar barometric conditions, the wind will veer from E.N.E. through South to W.S.W.; eastward of

130° W., half the recorded winds blew between East and South; south-easterly gales, sometimes of hurricane force, are frequent, especially between 125° and 130° W.

Fog is infrequent, except near Puget Sound.

March.—Between the Equator and 5° N., the prevailing winds blow as in February. Between 5° and 15° N., north-easterly winds prevail, and northward of Acapulco as in February.

Between 30° and 40° N., the prevailing direction is N.W., winds with any easting being rare, especially near the coast. Between 40° and 45° N., the wind will veer from E.N.E., with a falling barometer, through South to N.W., with a rising glass, the frequency of southerly winds decreasing, and of the northerly increasing, as the distance from the coast increases. Northward of 45° N., the same conditions prevail as between 40° and 45° N., but S.E. winds prevail near the coast, and N.W. winds westward of 125° W.; strong gales are frequent from all quarters.

Fog is occasionally met with northward of 25° N.

April.—Tedious calms prevail southward of 20° N. Between the Equator and 5° N., the prevailing winds blow as in February. Between 5° and 15° N., North and N.E. winds prevail, but close to the coast the prevailing direction is N.W. Between 15° and 30° N., N.W. winds are prevalent within a line from 100° W. on 15° N., to 130° W. on 30° N.

Between 30° and 40° N., easterly winds are rare, the prevailing direction being N.W. Between 40° and 45° N., the wind will veer from South with a falling barometer to North when it rises, holding longest at N.W. (S.W. beyond 130° W.), with occasional S.W. gales. Northward of 45° N., and eastward of 135° W., the wind will similarly veer from S.E. through South and West to N.W.; gales are frequent here, blowing from West to N.W. near the coast, from S.E. to S.W. between 125° and 130° W., and from E.S.E. to N.N.W. westward of 130° W.

Fog is occasionally met with northward of 25° N.

May.—Between the Equator and 5° N., light S.W. winds prevail, becoming south-easterly westward of 100° W. Baffling light winds are prevalent between 5° and 15° N. Between 15° and 35° N., N.W. winds are prevalent within a line from 115° W. on 15° N. to 130° W. on 35° N.

Between 35° and 40° N., the prevailing winds are N.W., easterly winds not being met with. Between 40° and 45° N., the wind will veer from South, with a falling barometer, to North with a rising one, holding longest at N.W. Northward of 45° N., and eastward of 135° W., the wind will similarly veer from S.E. to N.W., holding longest in the S.E. quadrant near the coast, and in the N.W. between 125° and 130° W.

Gales are seldom experienced in May, but fog is more frequent than in April.

June.—Between the Equator and 35° N., much the same conditions prevail as in May. Between the Equator and 10° N., south-easterly winds will be found westward of 110° W., and light baffling winds between 10° and 15° N.

Between 35° and 40° N., N.W. winds prevail, becoming more northerly and north-easterly westward of 130° W., and gales rarely occur. Between 40° and 45° N., the wind will veer from South, with a falling barometer, to North, with a rising one, holding mostly between N.W. and North westward of 125° W. Northward of 45° N., the wind will similarly veer from S.E. to N.W., blowing mostly from North and N.E. westward of 130° W.; gales seldom occur, and always from S.E.

Fog is frequently met with in June northward of 25 N.

July.—The S.E. Trade extends 5° or 6° North of the Equator, westward of 105° W., and much the same general conditions prevail as in June, between the Equator and 35° N.

Between 35° and 40° N., the wind blows almost exclusively from the northern semicircle, except near San Francisco, where south-westerly winds are frequent. Between 40° and 45° N., eastward of 130° W., N.W., N.N.W. and North winds prevail, N.N.W. being most frequent. Northward of 45° N., the wind will veer from S.E., with a falling barometer, to N.W. with a rising one; S.E. winds are frequent near the coast, and N.W. winds as far as 130° W., westward of which they mostly vary between S.W. and N.W.

Gales are rare in July, but fog is more frequent than in June.

August.—Southward of 15° N. south-westerly winds prevail as far West as 130° W., becoming southerly and then south-easterly as the Equator is approached. Between 15° and 35° N., north-westerly winds are most frequent, within a line from 110° W. on 15° N. to 130° W. on 35° N.

N.W. winds prevail along the coast and as far westward as 135° W. Between 35° and 40° N., the same conditions prevail as in July. Between 40° and 45° N., winds between N.W. and North prevail; but northward of 45° N., and westward of 125° W., westerly and south-westerly winds become more frequent.

Gales are rare in August, but fog is frequent northward of 25° N.

September.—Between the Equator and 20° N., north-easterly winds will be found near the coast, while farther off, as far as 120° W., the prevailing wind is S.W., becoming southerly and south-easterly as the Equator is approached. Between 10° and 20° N., cyclonic storms (of force 10) may be met along the route between San Francisco and the Equator. Between 20° and 35° N., north-westerly winds prevail within a line from 115° W. on 20° N. to 125° W. on 35° N.

Between 35° and 45° N., N.N.W. winds prevail. Northward of 45° N. the prevailing direction is N.W., but light south-easterly winds will be found near the coast, and south-westerly winds westward of 130° W.

Gales are uncommon, but fog is still prevalent northward of 25° N.

October.—Between the Equator and 15° N., the prevailing winds are north-easterly near the coast, while farther off they blow as in September, with similar cyclonic storms. Between 15° and 35° N., north-westerly winds prevail within a line from 105° W. on 15° N. to 130° W. on 35° N.

Between 35° and 40° N., N.W. winds prevail, while between 40° and 45° N. they are most frequent from S.S.E. and N.N.W. near the coast, and westward of 130° W. between S.W. and North. Northward of 45° N., the wind will veer from S.E., with a falling barometer, to S.W. and West, with a rising one; close to the coast, S.E. winds are most frequent, occasionally blowing a gale, but westward of 130°, S.S.W. winds blow longest and strongest.

Fog is still prevalent, much as in September.

November.—From the Equator to 10° N., southerly and south-westerly winds prevail as far as 120° W.; and cyclonic storms may be met between 10° and 20° N., as in September. Between 15° and 35° N., north-westerly winds may be expected as in October.

Between 35° and 40° N., winds from the N.W. quadrant prevail eastward of 130° W., and from the S.W. quadrant westward of it. Northward of 40° N., the wind will veer from S.E., with a falling barometer, to N.W., with a rising one, sometimes blowing a gale; S.E. winds prevail near the coast, inclining to S.W. westward of 125° W.

Fog is less frequent than in October.

December.—Between 5° and 15° N., north-easterly winds prevail, but between 5° and 10° N., the prevailing direction is S.E. westward of 105° W.; calms are frequent. Between Acapulco and 35° N., north-westerly winds prevail for a distance of 300 miles off the coast.

Between 40° and 50° N., the wind will veer from S.E., with a falling barometer, to S.W. and West, with a rising one; close to the coast the prevailing direction is S.E., and South farther off; westward of 130° W., as also between 40° and 35° N., the winds will have more westing. Squally weather may be expected over all this region, with rain, and frequent gales between S.S.E. and West.

Fog is less frequent than in November.

Page 1181.—**BEHRING SEA.**—See the Addenda for page 684.

Page 1182.—**Kamchatka.**—See the Addenda for page 731.
Kurile Islands.—See the Addenda for page 736, and page 1187.

Page 1183.—**Okhotsk.**—See the Addenda for pages 745-746.
Russian Tartary.—See the Addenda for page 767.

Page 1184.—**Japan.**—See the Addenda for page 779.

Page 1190.—**The Islands.**—Some more recent particulars of the winds, &c., of the various groups of islands, will be found in previous pages.

Page 1191.—**TYPHOONS.**—The subject of *Hurricanes*, the term by which these cyclonic storms are known in the West Indies, is fully treated in Findlay's "Directory for the North Atlantic Ocean," 15th Edition, which is considered to be introductory to this and the Author's other volumes on the Great Oceans. The theory of their origin, formation, wind circulation, general tracks, velocity, prognostics, &c., with rules for avoiding them, there given, will also apply generally to the Typhoons of the Far East, but there are certain local additional points which need elucidation here.

The subject of Typhoons has been carefully studied by the officials of the Observatories of Manila, Hong Kong, Tokio, and Shanghai (Zikawei), who have added much to our knowledge of these dangerous storms. Of the published results we may specially mention "The Law of Storms in Eastern Seas," by Dr. W. Doberck, Hong Kong, 1898; "Baguios ó Ciclones Filipinos," by Padre José Algué, Manila, 1897, of which a

French translation appears in the "Annales Hydrographiques," Paris, 1899 and 1900; "Die Orkane des fernen Ostens," by Dr. P. Bergholz, Shanghai, 1899, founded on Padre Algué's work, and of which an English translation was published in 1901; and an article on "L'Atmosphère en Extrême-Orient: Avis aux Navigateurs," by Père Aloys Froc, Director of the Zikawei Observatory, appearing in "Annales Hydrographiques," 1901, pp. 117-197, and 1902, pp. 169-237. The following remarks are gained from a perusal of the above works, which are well illustrated by diagrams, and to these the reader is referred should a more detailed account be required.

Extended observations show that in December, January, February, and March most of the hurricanes of the North Pacific arise in a lower latitude than 10° N., the limits being 5 and 12° N., between long. 143° and 145° E., recurving (before reaching long. 124° E.) between lat. 15° and 19° N. In April, May, October, and November they originate between lat. 6° and 17° N., long. 129° and 142° E., recurving between lat. 16° and 21° N. In June, July, August, and September (the typhoon months) they arise between lat. 8° and 20° N., long. 126° and 139° E., recurving between lat. 21° and 25° N.

Dr. Doberck says the most dangerous typhoons in the Pacific have been encountered between 130° and 140° E., in about lat. 12° N., where they move slowly in a W.N.W. direction. Such a storm first appears in the shape of a whitish arch soon developing into a dark and threatening cloud, above which the direction of the motion of the clouds is seen to be nearly perpendicular to the top of the arch.

Destructive hurricanes have also been met with far eastward of the above limits, causing much havoc in the Marshall and Caroline Islands, as described in the Addenda for pages 952 and 972. In the Marshall Islands hurricane of June 30, 1905, the storm travelled 230 miles in 12 hours, or at the rate of 19 miles an hour, an extraordinary velocity in such a low latitude (6°—7° N.) and most destruction was caused on the right-hand or northern side of the storm system. Such a storm has never previously been recorded in this region.

One of the earliest signs of the approach of a typhoon is the failure of the barometer to respond to the diurnal oscillation. In settled weather in these low latitudes a good mercurial barometer will show a decided maximum about 10h. a.m. and p.m., then recording (when corrected for error and temperature) between 29·85 and 29·95 (758·2 to 760·7 mm.); about 4h. p.m. and a.m., there should be a corresponding minimum about ·1 (2·5 mm.) lower. Should the barometer show less than these figures, a good outlook should be kept on the weather.

Dr. Doberck, in discussing the records of 244 typhoons occurring during the 13 years 1884-1896, in the China and Japan Seas and the western Pacific, gives the following monthly frequency:—January, 1; February, 0; March, 1; April, 4; May, 10; June, 24; July, 45; August, 43; September, 57; October, 31; November, 22; December, 6. He also classified and plotted the average paths of these storms, of which particulars are given in the Report of the Hong Kong Observatory for 1897, and these are also shown on the monthly Pilot Chart of the North Pacific Ocean published by the United States Hydrographic Office. The following remarks concern those met with in the western part of the North Pacific Ocean.

In *January* and *February*, typhoons are infrequent, and only originate in the vicinity of the Mariana or Caroline groups, the former recurving north-eastward before reaching the Philippines, and the latter are severely felt over the Pelew Islands and Mindanao.

In *March* and *April*, they are also infrequent, and those which develop North of 11° N. recurve to the N.E. before reaching Luzon. In *May*, they begin to be more frequent.

June, *July*, *August*, and *September* are the months in which typhoons mostly occur, and from four to six may be expected in each of the three latter months.

In *October* and *November*, two or three typhoons may be expected in each month, but in the latter month and *December* they are very severe. They are infrequent in December, and are then confined to the region between Guam and Luzon.

The following is a general description of the classified average tracks of typhoons originating eastward of long. 130° E., the per-centage referring to the 244 typhoons recorded:—

Class IIb.—Originates in lat. 13° N., and takes a north-westerly direction, passing across Formosa into China. It has a frequency of 7 per cent., and occurs from June to September, but mostly in August and September.

Class IVb.—Originates in about 10° N., northward of the Pelew Islands, thence passing over the southern end of Luzon into the China Sea. It has a frequency of 4½ per cent., and occurs during September, October, and November, but is not common in the latter month.

Class IIIc.—Originates in about lat. 15° N., long. 139° E., taking a north-westerly direction, crossing 20° N. in 126° E., and then passing away northward over the central

part of Korea and along the N.W. side of the Sea of Japan. It has a frequency of 4 per cent., and occurs in July, August, and September.

Class IIc.—Originates in about 19° N., 129° E., passes north-westward by the Meiaco sima group and northward of Formosa to the coast of China, recurving inland and then passing along the N.W. side of the Yellow Sea, crosses the northern part of Korea, continuing its course over the northern side of the Sea of Japan and over the North part of Yezo. It has a frequency of 3 per cent., and occurs from June to September, but mostly in July.

Class IIId.—This, the most common type of typhoon, originates in lat. 18½° N., long. 133½° E., passes over the islands southward of Kiusiu, along the eastern side of the latter and across Sikok and Nipon to the North coast of the latter northward of Kobe; thence along the S.E. side of the Sea of Japan as far as lat. 40° N., and then continuing in a N.E. direction across the North end of Nipon and the eastern part of Yezo. It has a frequency of 15 per cent., and occurs from June to October but mostly in August and September.

Class IIIe.—Another common type of typhoon, originates in about latitude 15½° N., 139½° E., describes a parabolic curve thence to 30° N., 135° E., not passing westward of 133° E., and thence trending away to the N.E. This is the most easterly type dealt with in these records; it has a frequency of about 12½ per cent., and occurs at any time from May to December.

Class IId.—Originates in lat. 23° N., long. 134° E., and passes away southward of the Lu-chu Islands into the interior of China. It has a frequency of 4 per cent., and occurs in July and August.

The remaining classes deal with regions outside the scope of this work, and it must be remembered that individual typhoons move over very irregular tracks, and their velocity is subject to no regular rules.

Pages 1194-1195.—**CURRENTS.**—The systematic classification and examination of current observations, and the drift of bottles, etc., in the Pacific Ocean, corroborate what was previously known, and the theories advanced, as to the circulation of its waters. At the same time, they also emphasise the fact of the great uncertainty of meeting a certain *surface* current where it might be reasonably expected. Current charts can only represent an ideal condition of the circulation, the surface current (which alone affects a vessel's course) being dependent upon the prevailing winds, the effects of storms, etc. An inspection of the "Quarterly Current Charts of the Pacific Ocean," prepared at the Meteorological Office, and published in 1897, will show the irregularity of the surface currents, as compared with the general direction of the drift below.

In the "Journal of the Royal Society of New South Wales," 1898, pages 120-131, is an interesting paper by Capt. M. W. C. Hepworth (since republished in "Notes on Maritime Meteorology," 1907), on the surface currents experienced on the direct route between Sydney and Juan de Fuca Strait, as derived from an examination of the logs of 62 passages made by steamers, at all seasons of the year. It is there also shown how dependent the surface currents are upon the winds. Further references will be made to this paper hereafter.

In the records of current-bottles, it must be remembered that the distance given between the points of despatch and arrival is the direct distance; the bottles, in many cases, must have made a far longer détour.

Pages 1195-1197.—**The NORTH EQUATORIAL CURRENT.**—The "Quarterly Current Charts" show there is a general westerly set across the open ocean between the parallels of 9° N. and 20° N., running from December to February at a varying daily velocity up to 30 miles, but westward of 155° E. velocities up to 40 and 50 miles are recorded. From March to May, between the same parallels, eastward of 150° W., the velocity appears to increase up to as much as a maximum of 40 miles per day, but it weakens over the western part of the area.

From June to August, eastward of 180°, the velocity of the westerly set may be as much as 40 miles a day, but westward of 180° there seems to be no constant set, northerly and southerly sets being sometimes found, and even an easterly set in about lat. 18½° N., between long. 137½° E. and 148° E. From September to November the westerly set is much as from March to May.

Among the Gilbert and Marshall Islands the currents are very irregular in strength and direction, particularly from November to March.

In the western part of its course it appears to divide into two branches, one turning northward past the Philippines joining its forces with the current out of the China

Sea to form the Kuro Siwo or Japan Stream; while the other branch turns southward and unites with the South Equatorial Current. The existence of the latter branch appears proved by the following records of current-bottles.

A bottle thrown over from the barque *Villalta*, in lat. 30° *N.*, long. 161° 30′ W., on August 24, 1896, was picked up on May 20, 1897, on Nui Island in the Ellice group, lat. 7° 13′ *S.*, long. 177° 14′ E. These positions are about 2,500 miles apart, and the time occupied was 269 days.

A bottle thrown overboard from the ship *Selene* when in latitude 21° *N.*, longitude 107° W., on December 7, 1901, was picked up on Tamana Island (one of the Gilbert group) in lat. 2½° *S.*, long. 176° E., on January 1, 1906, after a drift of about 5,140 miles in 1,486 days, or a daily rate of 3½ miles. On December 10, another bottle was thrown from the *Selene*, in lat. 21½° N., long. 113° W.; this was picked up on November 20, 1905, on Arorai (another of the Gilbert group), representing a drift of about 4,650 miles in 1,441 days, or a daily rate of 3¼ miles.

Capt. W. P. Stinson, U.S. transport *Logan*, 1903, remarked that on his passages between Guam and San Bernardino Strait he found a strong westerly set both during the S.W. and N.E. monsoons, increasing as the strait was approached, but stronger during the latter, it then running from 12 to 24 knots per day.

In June, 1903, the Dutch war-vessel *Edi* experienced a daily set of 39 miles to N.N.E. when in lat. 4½° N., long. 129½° E., and 23 and 34 miles on the preceding and following days, when on a voyage between Yap and Menado *(Annalen der Hydrographie*, June, 1907, pages 253-259).

Capt. J. E. Leach, cable steamer *Britannia*, writes that in September, 1901, on his voyage from Honolulu to San Bernardino Strait, he found no steady westerly currents as he had been led to expect, but they were most irregular both in direction and velocity from day to day, sets varying from South round by West and North to S. 55° E. having been encountered, and sometimes in opposite directions on succeeding days. The greatest velocity was 15½ miles per day to S. 88° W., in lat. 18½° N., long. 175¼° W.

It would be useless to give the varying experiences of other vessels traversing this region, but we may here draw attention to Capt. Hepworth's experience of occasional northerly sets dead against the N.E. Trade, between the parallels of 8° and 20° N., on voyages between Honolulu and Fiji. In January, they varied between N.N.W. (6 miles a day) and E.N.E. (25 miles), and he suggests that this may be the Equatorial Counter-current come to the surface after passing beneath the North Equatorial Current. For other particulars, the reader is referred to the paper mentioned in the Addenda for page 1194.

In conclusion, the drift of current-bottles proves that this westerly set does prevail more or less. A bottle thrown over from the schooner *Robert Lewers*, on August 17, 1896, was picked up on Likieb (Marshall Islands) on December 19, 1896, having thus drifted about 2,650 miles in 124 days, or at an average rate of 21½ miles per day. Another bottle thrown over from the ship *Seestern*, on October 7, 1904, in lat. 20⅓° N., long. 115⅓° W., was picked up at Guam on February 2, 1906, after a drift of about 5,900 miles in 483 days, equivalent to a daily rate of 12¼ knots.

As an interesting example of the alteration in the surface set in the south-western part of this region we may mention the drift of the steamer *Rangatira*, while broken down between the Pelew Islands and New Guinea, from November 18 to December 9, 1906, or during the season of the N.W. Monsoon. In this period of 21 days, during which there was little or no wind, the steamer drifted 448 miles to S. 71° E. from a position in lat. 4° 48′ N., long. 135° 1′ E., to 2° 22′ N., 142° 5′ E., where she was able to resume her voyage. The greatest velocity was found between 4° 20′ N., 138° 21′ E., and 3° 11′ N., 141° 55′ E., where the daily set varied from 34 to 53 miles between N. 86° E. and S. 49° E.

Pages 1197-1202.—**The EQUATORIAL COUNTER-CURRENT** is the equivalent in the Pacific Ocean of the Guinea Current in the Atlantic, and extended observation has shown that this is a more or less permanent easterly set between the North and South Equatorial Currents, but its limits and velocity vary with the seasons, &c., never being met with South of the Equator. As stated on page 1202, it appears to owe its origin to a return of the water drifted westward by the Trade Winds, its strength being chiefly dependent upon that of the South Equatorial Current, but it never attains the same velocity. From July to December it also receives an impulse from the S.W. Monsoon of the Indian Archipelago. In the northern winter, when the Equatorial limits of the Trade Winds closely approximate, its direction may be reversed by the prevailing easterly winds, but when these cease it again resumes its course. The transition from the North Equatorial Current to this counter-current is not so marked as the

division between it and the South Equatorial Current, which is often easily detected. It may be said to occupy the region of calms and variable winds between the Equatorial limits of the Trade Winds, and in the northern summer and autumn may extend across the ocean, from the Indian Archipelago to the American coast, its velocity varying between 10 and 50 miles a day. In winter and spring, the "Quarterly Current Charts" show it to be much less persistent. The average limits of this easterly set, eastward of the Marshall Islands, are well defined on the monthly "Pilot Chart of the North Pacific Ocean," published by the U.S. Hydrographic Office, thus:—

In *December*, *January* and *February* it runs eastward as far as long. 160° W., between the parallels of 2° and 4° N. on the South and 5½° and 9° N., on the North, the limits narrowing eastward. Between 160° and 155° E. it appears to be interrupted by a northerly surface set, and then is met with again as far as 120° W. over a belt between lat. 3½° and 7¾° on the South and 6° and 9¾° N. on the North. Between 120° and 114½° W. a north-westerly drift is met with, but the easterly set is again found, but not so persistent, between 114½° W. and 94° W., the belt on the latter meridian being between 2° and 4¼° N.

In *March*, *April*, and *May*, it flows eastward as far as 160° W. between the parallel of 5½° N. on the South and 7½° to 9° on the North. Between 160° and 150° W. a northerly surface set is encountered, and eastward of 150° W. the easterly set is again felt over a belt between 6° and 5° N. on the South and 9° and 10¼° N. on the North, ceasing eastward of 118° W.

In *June*, *July*, and *August*, it flows eastward as far as long. 155° W. between the parallels of 4° and 6° N. on the South and 7½° and 11° on the North. Between 155° and 144° W. a north-easterly surface set is met with, and eastward of 144° W. the easterly set is felt over a belt as far as 122° W., between the parallels of 5° and 6½° N. on the South and 11° and 12° N. on the North. Between long. 122° and 117° W. a north-easterly set may be felt, and eastward of 117° W. the easterly set again prevails as far as 100° or 95° W., over a belt between the parallels of 5° and 3° N. on the South and 10° and 8½° N. on the North.

September, *October*, and *November* are the months in which the Equatorial Counter-current runs most persistently, being felt over a continuous belt eastward of the Marshall group as far as long. 110° W. This belt is wider at its eastern limit, between 5° and 13° N., the southern limit varying between 3½° and 6° N. and the northern limit between 9° and 13½° N.

That the easterly set reaches far eastward of 110° W. is proved by the drift of the disabled steamer *Linlithgow*, between August 11, 1896, and October 12 following. Disabled on August 11 in lat. 5° 51′ N., long. 108° 32′ W., she drifted about 120 miles north-eastward in the following five days. Between August 16 and September 3, she was set about 600 miles eastward, during the last three days the daily average being from 48 to 63 miles. From lat. 8° N., long. 97¾° W., the set gradually became more northerly, crossing 10° N. in 95½° W. on September 13, and she was finally abandoned when in lat. 12¾° N., long. 93½° W.

Capt. Hepworth points out that on the direct steamer track between Fiji and Honolulu this counter-current may be met with between the parallels of 1° and 6° N., in May, June, and July, and between 5° and 9° N., in August, September, and October, the season of the S.E. Trade. From December to March, the season of the N.W. Monsoon, it slackens, or may be altogether absent.

Page 1201.—When crossed by H.M.S. *Challenger*, on the meridian of 150° W., this easterly counter-current was observed between 10° and 5° N., two streaks of maximum velocity being found, one between 10° and 9° N., and the other between 8° and 7° N., the mean daily set being 54 miles.

The SOUTH EQUATORIAL CURRENT is dealt with in the "South Pacific Directory," that portion of the Ocean embracing the greater part of its area.

Pages 1203-1208.—**The KURO SIWO** has had a great deal of attention devoted to it in recent years, and observation tends to show that, like the Gulf Stream of the Atlantic, it is subject to great variations in its *surface* set and velocity, which are considerably affected by strong winds and storms. In Petermann's "Geographische Mitteilungen," 1891, pages 209-219, is an article by Dr. G. Schott, mainly based upon German observations, of the currents in far eastern waters; and Lieut. Revertigat, of the French Navy, also wrote a work upon the same subject. From these, and other scattered articles, we have gained the following additional information upon this interesting current.

Dr. Schott's researches show that the Kuro Siwo proper throughout the year flows westward of the Meiaco sima, Lu-chu, and Linschoten Islands, but little current

being met with eastward of these islands till near the northernmost of them. (This, however, is contradicted by the experience of others; the Dutch war-vessel *Edi*, in March, April, and May, 1903, found the current setting at an average daily rate of 18 miles between N.E. and E.S.E., south-eastward of the Lu-chu Islands, and 26 miles N.N.E. westward of them.)

Farther to the eastward the eastern edge of the northerly drift from the North Equatorial Current is known as the *Bonin Current*, which is not always found westward of the Bonin group, it passing East of those islands at the end of summer.

On reaching the parallel of 30° N., the Kuro Siwo divides into two branches, the principal branch setting eastward through Colnett and Van Diemen Straits (especially the latter), while a subsidiary and much weaker branch continues northward into the Sea of Japan and flows along its western side, passing into the ocean again through Tsugar Strait.

The Kuro Siwo attains its greatest strength between Van Diemen Strait and Oo sima, but near the shore a narrow belt of counter-current will be found along the South coast of Sikok. The projection of the land at Oo sima diverts the current in a direction generally South of East, and it runs at a reduced velocity southward of a line joining Oo sima and Cape Idzu, varying between East and S.E. Northward of this line a weak south-westerly set prevails, but with southerly and easterly winds (which usually bring thick weather) there is a considerable inset towards the shore, which has been the cause of several wrecks.

On approaching the chain of islands southward of the Gulf of Yedo the current regains its former velocity, but still runs southward of East, afterwards closely following the shore between Cape Mela and Inuboye saki.

On passing Inuboye saki the Kuro Siwo meets the cold southerly Oya Siwo, in which the temperature may fall rapidly 14° below 66° or 68° F. in winter. In winter the boundary between these opposite currents extends in a north-easterly direction, while in summer (when the Kuro Siwo is so much stronger) the Oya Siwo is only met with over a belt reaching about 15 miles off shore as far as lat. 39° N., whence the line of demarcation takes an E.N.E. direction, passing about 100 miles off the southern shore of Yezo and the Kuriles. At this season a difference of 30° may be found in the temperature of the waters, or a fall from 70° to 40° F. in August. In passing from the Kuro Siwo into the Oya Siwo, the weather becomes colder and rainy, and the colour of the water changes from deep blue to bottle-green.

In summer, during the S.W. Monsoon season in the China Sea, the Kuro Siwo sometimes attains a velocity of 5 knots an hour off the East coast of Formosa, but the usual rate varies between 10 and 50 miles a day. In winter, the average velocity between Van Diemen Strait and Oo sima is about 40 miles in 24 hours, the maximum recorded being 60 miles, increasing to 65 and 70 miles in summer. Eastward of Oo sima the velocity decreases to a maximum of 25 to 30 miles.

Between Van Diemen Strait and Oo sima, the temperature of the Kuro Siwo varies from 68° F. to 86°; between Oo sima and Yedo Gulf, from 68° to 84°; and beyond that it has a mean of 75°.

Observations show that the width of the stream is comparatively narrow, especially in winter; Dr. Schott estimates it at from 250 to 500 miles between long. 133° and 140° E. At 150 miles off Sikok, currents are reported varying between S.S.E. and S.W., and strong currents setting between S.S.W. and W.N.W. have also been met with westward of the Lu-Chu Islands.

Page 1205.—The Kuro Siwo is deflected to the northward along the East coast of Formosa, until reaching the parallel of 26° (*not* 60°) N.

Pages 1208-1212.—**Eastward Drift.**—Between the parallels of 35° and 50° N., as far as long. 150° W., the prevailing westerly winds cause a surface set eastward, augmented by the Kuro Siwo after it leaves the coast of Japan. Eastward of 150° W. it gradually sweeps round north-eastward and northward and south-eastward and southward, but this drift is occasionally reversed by strong winds from the opposite directions. On nearing the American continent this drift has an average temperature of about 60° F., which in its passage to the southward is reduced to about 54° off San Francisco (see Addenda for page 1216).

Capt. J. E. Leach, cable steamer *Anglia*, writes that on his voyage from Nagasaki to Honolulu, in September, 1902, he ran along the parallel of about 30° N. as far as 176° E., and experienced currents varying between N. 13° E. and S. 84° W., round by East. Between 160° and 165° E. an extraordinary current was met with, running 20 miles a day between N. 60° E. and N. 75° E., and setting the vessel 10 miles northward

of her easterly course. Between 176° E. and the Hawaiian Islands little or no current was felt.

Capt. W. P. Stinson, U.S. transport *Logan*, 1903, stated that, on voyages between Nagasaki and San Francisco, after leaving Aogasima he always experienced a current setting N.W., about a knot an hour, until in lat. 33¾° N., long. 153¾° E., when a current setting to the North and East was met with as far as 180°. Thence to San Francisco little or no current was felt.

A buoy lost from the Japanese vessel *Banjo* on April 22, 1894, in lat. 37° N., long. 145° 25′ E., was picked up by the steamer *Kilauea Hou* on August 23, 1896, between the islands of Maui and Hawaii, in lat. 20° N., long. 156° W. A buoy thrown over from the ship *Albert Rickmers* in lat. 43° 28′ N., long. 178° 24′ W., on October 8, 1895, was picked up on February 21, 1896, off the coast of Washington, in lat. 47° 29′ N., long. 124° 53′ W.; the distance between these points is about 2,300 miles, traversed in 136 days, giving a daily rate of about 16 miles.

Another interesting event, which may be fairly attributed to this easterly drift, was the capture in San Francisco harbour, in January, 1908, of a large turtle having a tablet with a Chinese inscription attached to its shell, showing it to be a sacred turtle belonging to Pekin.

Page 1212.—**The OYA SIWO** has been found to attain a maximum daily velocity of 30 miles a day in summer off the East coast of Japan, but is seldom felt below lat. 38° 20′ N. The prevailing easterly current through Tsugar Strait (see Addenda for page 855) over-runs the Oya Siwo eastward of that strait.

Capt. H. J. Snow states that eastward of the Kurile chain, the Oya Siwo runs about a knot an hour in summer, but is wider and stronger in winter; N.E. winds may increase its velocity to 2 knots. Its temperature is coldest in summer, increasing from 30° F. in April to 42° in October.

Page 1213.—**SEA of JAPAN**.—In summer the northern branch of the Kuro Siwo passes along the western coast of Nipon at an average rate of 15 miles a day (see the Addenda for page 871). Between Nagasaki and Vladivostok a current setting northward has been observed, till it meets the cold current setting southward at 16 to 20 miles a day. At this season, near Japan the surface water temperature is about 80° F., ranging between 68° and 77° in the middle of the Sea of Japan, and falling to 60° in the above cold current.

In October, the northern branch of the Kuro Siwo has a temperature varying between 63° and 68° along the western shores of Japan, or 10° higher than the rest of the Sea of Japan. In winter, this current runs weaker between Kiusiu and Quelpart, owing to the then prevailing N.W. winds.

In the middle of the Sea of Japan the direction and velocity of the surface currents depend mainly on the winds.

Pages 1213-1214.—**SEA of OKHOTSK**.—In "Russland in Asien" (see Addenda for page 707) it is stated that, besides the *Kurile Current*, there are two other permanent currents in this sea. One, arising in its N.E. part, is apparently a western branch of the Kurile Current; this divides on the meridian of Kola River, one branch following the direction of the coast as far as Shantar Islands, while the other turns south-westward, running past the eastern side of St. Jona Island to the N.E. end of Saghalin, where it reunites with the first branch, known as the *Saghalin Current*. The second or *Liman Current* arises near Shantar Islands, and joins the outset from Amur River towards the North end of Saghalin. Capt. Snow states that in his experience he never felt the influence of the Kurile Current in the Sea of Okhotsk. Off the western side of the Kuriles, beyond the influence of the tidal streams between the islands, there is usually a current setting northward or north-eastward in calm weather, running about 10 miles a day, its temperature 5° or 6° higher than that of the Oya Siwo outside the islands. The prevailing N.W. winds of winter produce a drift across the sea, bringing fields of ice and piling up driftwood on the N.W. side of the Kurile Islands.

Pages 1214-1216.—**BEHRING SEA.**—The U.S. authorities state that in the vicinity of the Aleutian Islands and in Behring Sea, no reliance can be placed upon finding regular surface sets, as these are mainly dependent upon prevailing winds, and but little current is usually experienced in Behring Sea beyond 10 miles off the land.

Off the western shore in spring, there is a usual set to the N.E.; in 1886, a vessel made fast to an ice-floe during a protracted N.E. gale, was drifted 45 miles to windward in three days. About 30 miles off Cape Navarin, this current is said to split into two, one branch following the trend of the coast in a south-westerly direction, and the

other passing northward into Anadyr Gulf and then north-eastward, running strongly between St. Lawrence Island and Cape Tchaplin.

On the eastern side of the sea there is a general northerly set between St. Matthew and Nunivak Islands, continuing past the East side of St. Lawrence Island to King Island, whence it sets towards Port Clarence and then follows the trend of the coast.

Page 1216.—**COAST of CALIFORNIA, etc.**—An interesting enquiry into the origin of the belt of cold water along the coasts of Oregon and California (mentioned in the Addenda for pages 1208-1212), by R.S. Holway, appears in vol. iv., 1905, of the Geological Bulletin of the University of California. His researches show that it cannot be definitely traced southward of Point Concepcion, its coldest part (47° to 50° F.) in summer being near Capes Blanco and Mendociño.

That a northerly surface counter-current exists close along the coast within this cold southerly set is proved by the drift of buoys, logs, &c. An interesting example is the drift of the Columbia River bar-buoy, which was picked up off Karluk (Kodiak), having traversed a distance of about 1,500 miles in 150 days.

Page 1217.—**WEST COAST of MEXICO.**—In approaching from the West, H.M.S. *Impérieuse*, in 1897, found the current setting S.E. by E. 20 miles, and E. by S. 17 miles, on the two days before reaching the coast, but when within a distance of 80 miles of the shore found it running in a reverse direction, about 12 miles a day.

Pages 1219-1225.—**TIDES.**—*British Columbia.*—The Canadian government has recently devoted considerable attention to the apparently complicated tides of the Pacific coast, for which it now issues tide tables annually. In an article upon them by Dr. W. Bell Dawson, appearing in the "Journal of the Royal Astronomical Society of Canada," 1907, pages 213-227, it is stated that on this coast the leading feature of the tides is a pronounced diurnal inequality in time and height, according to the moon's declination and also subject to an annual variation with the change in the sun's declination. When the moon is farthest North or South of the Equator, the inequality between the two tides of the day is greatest, and the long and short runs of the stream occur.

The extreme tides of the year occur at the nearest point to the solstices at which the moon attains its greatest declination; they become equal when both sun and moon are on the Equator, or when they are on opposite sides of it at distances proportional to their respective effects.

A tide of this character is apt to be termed irregular by the mariner, spring and neap tides being thus reduced to a secondary feature; but this tide is perfectly astronomical, and its prediction just as definite as for any other type of tide.

In Juan de Fuca Strait and the Strait of Georgia, the inequality is greatest; thus, during the greater part of the day, there may be a long stand near high-water level, with a short and sharp drop to the lower low water which occurs once in the day. (See also Addenda for page 322.)

Central Pacific.—In this region, if anywhere, an ideal condition of the tides might be expected to exist, whereas, in reality, they are very anomalous, both in the interval between succeeding tides and in their relative height. Thus, at Honolulu, the interval varies from 10¼ to 14¾ hours (about the same as at other ports around the shores of the North Pacific Ocean), and the average rise is 1½ foot; while at Apia (Samoa) the interval varies only from 12h. 7m. to 12h. 39m., and the average rise is 3 feet. These and other apparent discrepancies are fully discussed in a study of the "Tides in the midst of the Pacific Ocean," by Alexander Brownlie, in the Bulletin of the American Geographical Society of New York, 1902, pages 17-25 and 117-131.

Pages 1228-1229.—**MAGNETIC VARIATION.**—The diagram illustrating the general trend of the *isogonic lines* must only be considered as an approximation, but few reliable observations being available for the open ocean. Consequently, in laying a long course, it must be remembered that such variation charts are uncertain to the extent of one or two degrees in the open oceans.

That this is the case is proved by the results of the *magnetic survey* of the Pacific Ocean, now being brought to a conclusion, by the Carnegie Institution of Washington, U.S. The wooden brig *Galilee* was purchased and specially adapted for such a research, and began her work in 1905. She has since traversed the ocean between Alaska and New Zealand on the North and South, and between California, Peru and China on the East and West, and was expected to complete the survey in May, 1908, after traversing upwards of 65,000 miles. The observations made between San Francisco and Honolulu show that the variation charts in use give an amount of easterly variation too low

by 1° or 2°, or sufficient to place a vessel 35 miles North of her supposed position on such a voyage. A greater difference than this was found in other parts of the North Pacific. The dip values were also found to be too low by amounts varying from 1° to 3°.

See also Addenda for page 324.

We may here also mention the formation in 1907 of an association in the United States to be known as the *Pacific Scientific Institution*, with a view to undertaking a complete scientific exploration of the Pacific Ocean and its islands. It is estimated that 15 years may be occupied in this work.

Pages 1229-1230.—**ICE.**—Some observations on the ice of Behring Sea, &c., are given previously, in the Addenda for pages 684, 698, 700-701; and on that of the Kurile Islands and the Sea of Okhotsk in the Addenda for pages 736 and 742.

Another region in which ice may form a serious danger to navigation is that eastward of Tsugar Strait, as already referred to in the Addenda for page 854. Capt. J. Matthias, steamer *Ness*, on March 18, 1900, encountered much field-ice about 130 miles eastward of Yezo, or from a position in lat. 42° 36′ N., long. 145° 18′ E., to another in 42° N., 144° 25′ E., thus passing through 80 miles of it in 13 hours, and starting some of her rivets. On February 27-28, 1900, the steamer *Milos* passed through about 100 miles of field-ice, in approximately the same position, and sustained considerable damage.

On March 21, 1901, the steamer *Tartar* was damaged by ice in lat. 42° 48′ N., long. 147° 9′ E.; and on March 18 the steamer *Ping Suey* was similarly damaged in lat. 43° 42′ N., 147° 20′ E. On February 21, 1902, the steamer *Oceano* passed a field of ice 20 miles in length, between lat. 42° and 43° N., in long. 145° E., and a week later the steamer *Quito* suffered considerable damage from it.

These and other experiences show the necessity of approaching this region with considerable caution in the early months of the year.

Page 1230.—**DENSITY.**—Appendix No. 9 to the U.S. Coast Survey Report, 1897 8, is an article by Mr. A. Lindenkohl on the Salinity and Temperature of the Pacific Ocean, in which, among other things, he draws attention to the fact that Admiral Makaroff, in 1887, found a surface density of 1·0276 in lat. 23° 50′ N., long. 163° 16′ E.; and Moser, in 1896, found 1·0271 in lat. 28° N., long. 167° E. We cannot further pursue this subject here.

Pages 1231-1232.—**TEMPERATURE.**—Those interested in this subject cannot do better than refer to the interesting illustrated articles by Sir John Murray, "On the Annual Range of Temperature in the Surface Waters of the Ocean," in the Geographical Journal, August, 1898, pages 113-134, and "On the Temperature of the Floor of the Ocean and of the Surface Waters," in the same Journal, July, 1899, pages 34-51. These are founded upon the "Quarterly Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans," issued by the Meteorological Council in 1884, combined with later information.

In the North Pacific Ocean area, the annual range of temperature in the surface water, with which the ordinary seaman is most concerned, is greatest (from 28¾° to 81½° F., or about 53°) in the Sea of Japan in the region southward of Vladivostock, where the surface is alternately occupied by polar and tropical water. The highest recorded temperature in the tropical part of the open ocean is 90°. This range of surface temperature has a very important effect in bringing about a vertical circulation in ocean waters, the cooling by night, and during winter in temperate regions, causing the surface water to sink below the lower warmer stratum.

In the open ocean it has been found that below a depth of 100 fathoms, or the limit of penetration of the sun's rays, the temperature remains practically constant all the year round, and over by far the greater part of the North Pacific it varies only between 35° and 40° F., while in some parts it is below 30° at the bottom. In the deepest soundings (5,070 to 5,269 fathoms) taken by the U.S.S. *Nero* (see page 266) the bottom temperature was 36° F., and on the surface 84°; the highest surface temperature (89°) was found between Guam and Luzon, in latitude 15° 7′ N., long. 122° 19¾′ E.

Pages 1232-1233.—**DEPTH.**—Of recent years extensive series of deep-sea soundings have been taken in the Pacific Ocean by vessels engaged in surveying or in ascertaining the best routes for telegraph cables. These researches show that the ocean bed of the Pacific does not present the same uniform features as that of the Atlantic, the deepest parts being separated from each other by less profound areas, and extensive submarine mountain ranges and steep isolated peaks have been found in certain

regions. As in the other great Oceans, it has also been found that the deepest parts are not far from land, and it has been surmised that the flood-waves which have devastated the coasts of Japan may have been caused by subsidences of the steep ocean bed into the abysmal trough eastward of those islands.

We cannot pursue this interesting subject here, beyond giving a few of the more striking details. For a graphic view of it, the reader is referred to the splendid "Carte générale Bathymétrique des Océans," published in 1905, under the auspices, and at the expense, of the Prince of Monaco.

The present state of our knowledge of the depths of the North Pacific Ocean is chiefly due, in addition to the researches of the vessels mentioned on page 1232, to the following sources:—

Numerous series of soundings carried out by the U.S.S. *Albatross*, during the years 1888, 1889, 1890, 1891, 1893, 1894, and 1896, in the northern and eastern regions of the Ocean between Alaska and Lower California and between California and Honolulu, and in the Sea of Okhotsk and adjacent waters.

The U.S.S. *Thetis* sounded parts of Behring Sea in 1889, and a region off the coast of Lower California in 1894. The U.S.S. *Alert* and *Mohican* also sounded parts of Behring Sea in 1891.

In the more central part of the Ocean, lines of soundings were taken by H.M.S. *Penguin*, in 1897, between Fiji and Fanning Island, and by H.M.S. *Egeria*, in 1899, between Vancouver Island and Fanning Island. In 1901, the cable steamer *Britannia* carried out a line of soundings between New Zealand, New South Wales and Vancouver Island, by way of Norfolk Island, Fiji, and Fanning Island, in examining the route for the telegraph cable.

The south-western part of the Ocean has had lines of soundings carried out in it by the Dutch vessel *Edi* in 1903, and the German cable steamer *Stephan* in 1905, in connection with the cable route from Menado, Celebes, to the Pelew Islands, Yap, and Guam, and from Yap through the Lu-chu Islands to Shanghai. In 1904, the cable steamer *Colonia* also examined the region eastward of the Philippines. The work of the *Edi* and *Stephan* is fully described and illustrated in the "Annalen der Hydrographie," March, 1907, pages 108-113; at a few miles eastward of the Pelew Islands, Yap, the southern Mariana Islands, and the Lu-chu Islands, narrow abysmal depressions were found in the ocean bed, with greatest depths of 4,413, 4,116, 5,261, and 4,085 fathoms, respectively, separated and surrounded by depths considerably less.

What may be considered as the most interesting and complete examination of the North Pacific Ocean depths is that carried out by the U.S.S. *Nero*, from May, 1899, to January, 1900, in connection with the survey for the telegraph cable route from Honolulu to Guam, Yokohama, and Dingala Bay, Luzon. These researches extended over a belt 6,144 miles in extent, and about 14 miles in width, the soundings taken numbering 2,074, or on an average one to every 3 miles. An interesting record of this voyage is given by J. M. Flint in the "Bulletin No. 55 of the U.S. National Museum," 1905, from which the few following remarks are derived.

At 30 miles North of Oahu a depth of about 2,500 fathoms is found, and hence to Midway Islands the depth varies between this and 3,000 fathoms, with the exception of a few isolated spots with depths between 1,463 and 2,000 fathoms.

About 30 miles south-westward of Midway Islands a submarine peak was found, rising abruptly from 2,000 fathoms to within 82 fathoms of the surface. For about 1,000 miles westward of this, depths varying between 2,926 and 3,382 fathoms were found. About midway between Midway Islands and Guam a submarine mountain range was encountered, extending over 3° of longitude, covered by depths varying between 3,000 and 720 fathoms, followed for the next 300 miles by another plain with depths between 3,006 and 3,243 fathoms. This is succeeded by a mountainous region, with peaks rising to 689 fathoms below the surface, and valleys descending to below 5,000 fathoms. In one area, appropriately named the *Nero Deep*, a depth of 5,269 fathoms was attained in lat. 12° 43¼′ N., long. 145° 49′ E., or about 75 miles E.S.E. of Guam, the deepest sounding ever recorded, being only 66 feet less than 6 statute miles.

Between Guam and Dingala Bay the ocean bed is mostly undulating between depths of 2,500 and 3,000 fathoms, but elevations with 1,346 and 1,560 fathoms respectively were found about 120 and 600 miles westward of Guam, and one of 821 fathoms about 120 miles from Dingala Bay. On this section the deepest sounding was 3,547 fathoms, in lat. 14° 50′ N., long. 130° 31½′ E.

The section between Guam and Yokohama passed westward of the Mariana Islands and eastward of the Bonin Islands, for the first 500 miles the bottom being undulating with an average depth of 2,100 fathoms. Between lat. 21° 45′ and 22° 8′ N., three submarine peaks of 483, 838, and 802 fathoms were found, with intermediate depths

of about 1,000 fathoms. Thence onward the depth varied between 972 and 3,595 fathoms, the latter in lat. 23° 52½′ N., long. 143° 37¾′ E.

Some notes on recent researches in the depths of the South Pacific Ocean are given in the Addenda for page 1155 of Findlay's "South Pacific Directory."

We cannot here enter into a discussion as to the materials covering the floor of the Ocean; this subject has been dealt with in Findlay's "North Atlantic Directory." For fuller particulars the reader is referred to an interesting paper by Sir John Murray, on "Deep-sea Deposits and their Distribution in the Pacific Ocean," appearing in the "Geographical Journal," June, 1902, pages 691-711; and to the record of the voyage of the *Nero*, previously mentioned.

Page 1233.—**SUBMARINE VOLCANIC SHOCKS.**—Except in the neighbourhood of active volcanic regions around the shores and certain islands of the North Pacific Ocean, we have no records of recent submarine disturbances in the open ocean.

On March 7, 1898, the barque *Portland*, Capt. C. B. Larsen, when in lat. 20° 22′ N., long. 129° 36′ W., experienced a severe shock lasting about 20 seconds, and three other shocks in the next 2 or 3 hours.

On October 23, 1902, the ship *Artemis*, Capt. O. Schmidt, when off the Oregon coast, in lat. 43° N., long. 128° W., was twice violently shaken, as though the keel had struck some obstruction.

Page 1234.—**GREAT CIRCLE SAILING.**—A very complete account of the different methods is given by Mr. G. W. Littlehales, in his pamphlet on "The Development of Great Circle Sailing," illustrated by diagrams, and published by the United States Hydrographic Office. Reference should also be made to the diagrams appearing on the North Pacific Pilot Charts, December, 1895, and October, 1896, published by the same Office; the former is a gnomonic chart for the Pacific Ocean, between the parallels of 65° S. and 20° to 25° N., on which any straight line represents a portion of a great circle, and the latter gives a diagram, by Commander C. D. Sigsbee, U.S.N., for the graphical solution of spherical triangles.

In 1907, an interesting work was published in Germany, entitled "Die Reisen deutscher Segelschiffe in den Jahren 1893 bis 1904, und ihre mittlere Dauer," by A. Paulus. This deals with the routes followed, and the duration of voyages, by German sailing vessels to, from, and between all parts of the world during the years 1893-1904.

Pages 1235-1240.—**PASSAGES from Cape Horn to California, etc.**—The United States Hydrographic Office has devoted much attention to this passage, and the result of its investigations appears on the monthly "North Pacific Pilot Chart," issued by that Office, and from which the following Table is compiled. This, in connection with the Table of Trade Wind Limits, in the Addenda for pages 1167-1169, should enable the mariner to make a speedy passage.

Month.	Cross Equator in Long. W.	Probably lose S.E. trade in Lat. N.	Probably enter N.E. trade in Lat. N.	Probably lose N.E. trade in Lat. N.	Month.	Cross Equator in Long. W.	Probably lose S.E. trade in Lat. N.	Probably enter N.E. trade in Lat. N.	Probably lose N.E. trade in Lat. N.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
Jan. ...	113 0	4 30	8 0	26 30	July ...	118 15	6 15	14 30	33 30
Feb. ...	114 0	3 45	6 30	28 15	Aug. ...	117 45	6 45	14 0	32 30
March.	112 30	2 15	4 15	27 15	Sept....	114 0	6 0	14 15	31 45
April ...	117 0	3 30	6 45	29 30	Oct. ...	115 30	5 30	12 0	29 0
May ...	117 30	3 30	8 0	30 0	Nov....	115 45	6 30	10 0	28 15
June ...	117 45	6 0	11 0	32 15	Dec. ...	115 15	6 0	9 30	29 30

The duration of voyages of German sailing vessels (see above) from the English Channel varied as follows:—To Mazatlan, between 101 and 171 days; Santa Rosalia, 108 and 217; San Diego, 116 and 162; Port Los Angeles, 110 and 170; San Francisco, 98 and 185; Astoria, 111 and 153; Cape Flattery, 116 and 167; and to Honolulu, between 102 and 170 days.

Page 1240.—**From California, etc., to the Equator and Cape Horn, etc.**—Investigations carried out by the U.S. Hydrographic Office show that the quickest passages between San Francisco and the Equator are made by standing well out towards the meridian of 130° W., and then running through the N.E. Trades on a course not passing eastward of 120° W. before falling in with the S.E. Trades, the average

duration of the voyage to the Equator being 24 days, and the approximate distance 2,600 miles. In this way the area of the Equatorial calm belt and easterly counter-current will be crossed under the most advantageous circumstances, and the effects of the latter should not place a vessel eastward of long. 120° W. The following Table is compiled from the U.S. Pilot Chart.

Month.	Cross Lat. 30°N. in Long. W.	Cross Lat. 20°N. in Long. W.	Cross Lat. 10°N. in Long. W.	Cross Equator in Long. W.	Month.	Cross Lat. 30°N. in Long. W.	Cross Lat. 20°N. in Long. W.	Cross Lat. 10°N. in Long. W.	Cross Equator in Long. W.
	° ′	° ′	° ′	° ′		° ′	° ′	° ′	° ′
Jan. ...	127 45	126 30	125 0	126 0	July ...	127 30	124 0	121 0	125 45
Feb. ...	127 45	125 30	123 15	125 15	Aug. ...	129 0	127 15	125 15	123 45
March .	127 30	124 30	121 30	123 45	Sept....	129 0	124 45	121 0	125 30
April ...	128 15	125 45	122 0	125 45	Oct. ...	129 15	128 0	126 45	126 0
May ...	127 30	125 0	122 30	125 0	Nov....	128 45	125 0	121 30	125 30
June ...	127 30	126 0	125 0	125 30	Dec. ...	128 15	126 45	125 30	126 45

The duration of voyages of German sailing vessels (see page 267) to the English Channel varied as follows:—From Punta Arenas, between 112 and 203 days; San Juan del Sur, 106 and 166; Corinto, 104 and 139; San Francisco, 97 and 170; Astoria, 103 and 163; and from Cape Flattery, between 103 and 171 days.

Pages 1242-1244.—**Between CALIFORNIA, &c., and AUSTRALIA.**—The large and increasing export of coal from New South Wales to the West coast of North America, &c., has given occupation to a large number of sailing vessels. The United States Hydrographic Office and the German Seewarte have devoted much attention to the collection and tabulation of the routes taken by these vessels, by which they have been enabled to issue recommendations for those engaged in this traffic, and the following notes are drawn up from these sources. The passage between Newcastle and San Francisco has varied between 45 and 100 days, the average passage being about 65 days.

In connection with these passages, the reader should refer to the Table of the Trade Wind Limits, in the Addenda for pages 1167-1169, which will assist him in deciding on the best route to be followed at any season.

Australia to California, &c.—Vessels departing during the southern winter, from April to the middle of October, are recommended to take the *western* route, passing northward of New Zealand, between the Tonga Islands and Low Archipelago, and eastward of Hawaii. On this route, the average track crosses the meridian of 180° in 34° S., the parallel of 30° S. in 161° W., the Equator in 151° W., and 30° N. in 152½° W. On this route, the distance traversed will vary between 7,900 and 8,200 miles.

If possible, vessels are recommended not to get northward of the parallel of 33½° S., till the meridian of 167° W. be attained, and to endeavour to cross the parallel of 30° S. in 158° W., or even farther eastward, and 25° S. in 153° W., as but little easting can be made in the trade-wind region.

Endeavour to make sufficent easting in the S.E. Trade to cross the Equator in 149° W., or even farther eastward, but if this cannot be done that meridian may be attained in the Equatorial counter-current. In April, May, and June endeavour to cross 5° N. in 145° W., but in later months strive to cross 10° N. eastward of 147° W. On leaving the trade-wind region continue the northerly course till the destined port bears true East or southward of East. By this route the average voyage occupies about 67 days.

Vessels leaving during the southern summer, from the middle of October to March, are recommended to take the *eastern* route, passing southward of New Zealand, and keeping southward of 40° S. till near 135° W., and eastward of the Low Archipelago, crossing 30° S. near 130° W., and the Equator as in the route from Cape Horn (see the Table on page 267), the distance varying between 8,700 and 9,000 miles, and the average voyage 73 days.

Thus vessels, will also avoid the hurricane regions of the western part of the S.E. Trade area, and those off the Mexican coast, in the summer season of their respective hemispheres.

In the northern summer, after passing through the N.E. Trades, the voyage is usually obstructed by the calms and variable winds met with in the high pressure area off the Californian coast, or by the northerly winds prevalent on its eastern side. In winter, these winds are much less felt.

California, &c., to Australia.—This voyage is much more simple than the reverse voyage, owing to the Trade Winds being in its favour, and the distance to be traversed

may not differ much from the great circle route of 6,400 miles from San Francisco to Newcastle, in from 53 to 61 days.

Vessels departing, from April to the end of September, use the *northern* route, crossing the Equator between 150° and 155° W., 10° S. in 170° to 175° W., thence N.W. of Samoa and Fiji, and S.E. of New Caledonia.

From October to the end of March, vessels take the *southern* route, crossing the Equator in 145° to 150° W., and thence make for Niue or Savage Island, and thence southward of the Tonga Islands.

From the middle of November to the middle of February, vessels could also steer to pass between the Marshall and Gilbert groups, crossing the Equator in 169° E., thence passing between the Solomon and Santa Cruz Islands, and to the N.W. of New Caledonia. By taking this route the German ship *Gertrud*, Capt. T. Henke, leaving Guaymas on February 11, 1904, made the voyage to Port Adelaide in 65 days.

California, &c., to Western Australia.—Captain J. Ramselius, barquentine *J. L. Eviston*, suggests from his experience that vessels leaving the Pacific States from February to the middle of June should take a route viâ Torres Strait, or preferably north-westward of New Guinea through Dampier Strait or between Waigiou and Aiou Islands, and thence through Pitt Passage, Manipa Strait and Ombay Passage, or preferably pass windward of Timor. By this route the vessel should suffer much less than by beating to windward against the succession of westerly gales which prevail at this season southward of Australia.

The route would first follow that for vessels bound to China and Japan, and then past Guam, close eastward of the Pelew group, westward of St. David or Freewill Island, and then close to the New Guinea coast, to avoid the strong north-westerly current out of the channel between Aiou and Asia Islands.

Australia to Mexico.—For this voyage, vessels should always take the southern route, passing northward or southward of New Zealand, according to the season, and make their easting in South latitude.

Vessels, leaving between the middle of April and the middle of September, pass northward of New Zealand, and keep southward of the parallel of 35° S. till near 145° W., and thence steer to cross 30° S. in 126° W., and 25° S. in 118° to 119° W., but it appears advisable not to cross the Equator eastward of 112° W., in making for port.

From the middle of September to the middle of April, vessels pass South of New Zealand, and endeavour to attain 30° S. in about 110° W., and the southern edge of the N.E. Trade in 109° W., or farther eastward if possible, and not making eastward for port till its latitude be attained.

Mexico to Australia.—From April to September, vessels usually take the northern route as from California, &c., but after the end of June the southerly winds on the northern boundary of the S.E. Trade will enable a vessel to reach the S.E. Trade region and then pass northward of the Fiji Islands.

From October to February vessels steer to cross 10° N. in 120° W., passing through the region of Equatorial calms to the S.E. Trade, and then south-eastward of the Low Archipelago. In March it might be best to cross 10° N. in 142° W., as in the route from California, &c.

Australia to Honolulu.—The western route is always taken, during the southern winter following the route given for vessels bound to California, &c., till the southern boundary of the N.E. Trade is reached.

Vessels, leaving from November to March, should endeavour not to cross the parallel of 30° S. westward of 155° W., nor the Equator westward of 145° W. In approaching the Sandwich Islands, beware of getting becalmed under their lee.

Pages 1244-1246.—**BETWEEN CALIFORNIA, &c., and CHINA, &c.**—The following information on the routes from the Pacific States to Hong Kong, Yokohama, &c., and back, is chiefly derived from the most recent United States authorities.

San Francisco to China and Japan.—On the monthly "Pilot Chart of the North Pacific Ocean," issued by the U.S. Hydrographic Office, the following routes are recommended for sailing vessels, "direct" courses being understood as by Mercator chart.

In *September*, *October*, *November*, and *January*, steer a direct course to a position about 60 miles south-eastward of Hawaii, and then run along the parallel of 18° N. as far as long. 160° E., whence a direct course may be steered for Yokohama. If bound to Hong Kong, from 160° E. steer direct for a position in lat. 21½° N., long. 146° to 148° E., and then run westward along that parallel for port. In *January*, however, to reach the northern limit of the N.E. Trade, it may be advisable to steer a more

southerly course from San Francisco, or to a position in about lat. 27° N., long. 134½° W., whence lay the course to pass south-eastward of Hawaii, as before.

In *February*, *March* and *April*, steer a little southward of the direct track from San Francisco to off Hawaii, as last advised, and then run along the parallel of 18° N. as far as long. 155° E., whence steer to make 140° E. in about 25° N., and run along that meridian for Yokohama. If bound to Hong Kong, when the parallel of 21½° N. is attained steer along it to port.

In *May* and *June*, steer as last advised till in long. 151° E., and then direct for Yokohama. If for Hong Kong, from 18° N., 151° E., steer for a position in 21½° N., 144° or 145° E., and then proceed as before.

In *July* and *August*, a nearly direct course may be made to pass south-eastward of Hawaii, and then along the parallel of 18° N. as far as 160° E., whence steer direct for Yokohama. If bound for Hong Kong at this season, from 160° E. steer to pass southward of Guam and then along the parallel of 12½° N. to pass through San Bernardino Strait into the China Sea.

From Columbia River, Juan de Fuca Strait, &c., steer away westward as far as about long. 130° W., and then run southward to join the track from San Francisco.

China and Japan to San Francisco, &c.—If bound from Manila and Hong Kong, sailing vessels pass eastward of Formosa, then between the Linschoten and Lu-chu Islands, and south-eastward of Japan, running down their easting northward or southward of the parallel of 40° N., as hereafter advised. In connection with this passage it may be mentioned that in November, 1907, a drifting explosive mine was reported to have been seen in lat. 38° 16′ N., long. 170° 8′ E.

In *April*, *May*, *June*, *July*, *August* and *September*, the sailing route from off Yokohama crosses 150° E. in 38° N., 160° in 40¾°, 170° in 42½°, and 180° in 43°; thence along the latter parallel till in 160° to 155° W., when a direct course may be laid for Juan de Fuca Strait or Columbia River, and rather northward of a direct course for San Francisco. In *April*, however, the respective courses diverge on attaining 166° W.

In *October* and *November*, if bound to San Francisco, from off Yokohama steer to attain 40° N. in about 160° E., and then run along that parallel to 140° W., thence bearing away for port. If for Juan de Fuca Strait or Columbia River, from off Yokohama steer for a position in about lat. 42° N., long. 156½° E., and proceed eastward along that parallel to 165° W., when bear away direct for port.

In *December*, *January*, *February* and *March*, the sailing route crosses the ocean along the parallel of about 38° N. to San Francisco; if bound for Juan de Fuca Strait or Columbia River, proceed as in October or November, and bear away for port on attaining long. 170° W.

The average passage from Yokohama to Portland is 33 days, but in October to November, 1897, the barque *Selkirkshire* made it in 21 days. In January to February, 1896, the schooner *Aida* made the passage from Shanghai to Port Townshend in 27 days, the course from the South of Japan approximating to a direct line across the ocean on the chart, crossing long. 180° in lat. 40° N.

Steamer Routes.—The U.S. transport steamers bound to and from Honolulu, Guam, and Manila follow great circle tracks as far as possible. If bound to Yokohama, they shape the course so as to avoid the region of strong westerly winds and the strength of the Kuro Siwo.

Full-powered steamers from Juan de Fuca Strait to Yokohama steer to cross 140° W. in 51° N., and then run along that parallel to 180°. Thence, in summer, they steer to cross 160° E. in 48° N., 150° E. in 43½° N., and in winter cross 160° E. in 49° N., and 150° E. in 44½° N.; afterwards making for Kinkuwasan light. They thus pass northward of the region of strong westerly winds, and keep in the track of the cold westerly current.

From Yokohama they cross 150° E. in 40° N., 160° E. in 44½° N., 170° E. in 47½° N., 180° in 49° N., keeping on that parallel to 140° W., and thence steering for Juan de Fuca Strait. They thus get the benefit of the warm easterly current.

Low-powered Steamers.—In the "Annalen der Hydrographie," February, 1907, pages 53-64, is an interesting discussion by Herr E. Knipping of the 26 voyages and meteorological experiences of three German cargo steamers of about 2,800 tons register, and averaging 8 to 10 knots an hour, running between Portland and Yokohama. In summer (April to September) the average voyage eastward lasted 17¼ days, and in winter 19 days. In summer the westward voyage occupied 18½ days, and in winter 21¾ days.

The result of this discussion is to recommend such vessels in winter to take the Mercator track westward across the ocean, although it is 248 miles longer than the modified great circle track, as the weather is finer, with fewer and less violent storms,

causing less wear and tear of crew and ship. Bound eastward in winter the course recommended is the great circle from off Yokohama to long. 172° W., and thence along the parallel of about 46° N., the distance being only 83 miles longer than the modified great circle track.

In summer the latter route westward also appears preferable to the great circle track, which can be taken in the route eastward.

Pages 1247-1248.—**Panama to California, &c.**—Sailing vessels are now recommended to steer at all seasons for the S.E. Trades, and pass northward of the Galapagos, steering westward as far as 105° W., and then to join the track from the Equator (see Addenda for pages 1235-1240).

Page 1248.—**San Francisco, &c., to Panama.**—From December to May, vessels steer southward, keeping about 100 miles off the Californian coast and 150 miles off the Mexican coast. From June to November, they should stand well out to sea, crossing the Equator in about 104° W., and continuing southward till sure of making Panama on the starboard tack.

From Lower California Northward.—Sailing vessels must stand right out to sea on the starboard tack to join the route from the Equator.

Page 1251.—**San Francisco, &c., to Juan de Fuca Strait.**—In *January*, *February*, *March* and *April*, the track on the U.S. Pilot Chart is first south-westward and westward, and then northward to cross 40° N. in about 130½° W., whence the course is set towards the strait. During the remainder of the year, the south-westerly and westerly course is maintained till in 136° to 139° W. In winter the voyage has occupied from 4 to 17 days, and in summer from 8 to 21 days.

A discussion of the tracks of numerous vessels by the U.S. Hydrographic Office does not tend to support the above advice, as it shows that the average duration of the voyage for vessels keeping eastward of 127½° W. was 7½ days, and 13¼ days for those passing westward of that meridian. The drawbacks to the inner route, especially for square-rigged vessels, are the prevalence of N.W. winds and fog, especially in summer.

The captains of schooners carrying timber from San Pedro and adjacent ports to Juan de Fuca Strait, also do not consider it advisable to go westward of 128° W. in winter, as they so get the benefit of the south-easterly gales then prevalent. Thus in January, 1905, one schooner reached Port Townshend in 12 days, while two others by the outer passage took 27 and 30 days respectively.

Page 1252.—**San Francisco, &c., to the Hawaiian Islands.**—In summer the average passage from San Francisco to Honolulu is 17 days, and in winter 22 days. In February, 1897, the schooner *R. W. Bartlett* made the voyage to Hilo in 10 days.

If from Juan de Fuca Strait vessels are advised not to pass westward of 130° W. till on the parallel of San Francisco, an average voyage taking 5 or 6 days. By this means they avoid the region of high barometer to the westward of 130°, in which light and variable winds prevail, and where vessels may be delayed for a week or more in excess of the route above recommended.

Hawaiian Islands to San Francisco, &c.—In 1897, the average passage of 19 vessels to San Francisco was 17 days, and to Juan de Fuca Strait 19½ days. Beware of turning eastward too soon, to avoid the calms and north-easterly winds of the region of high barometer.

Page 1253.—**San Francisco to Callao.**—From May to October, or even later, vessels have shortened this voyage by following the eastern route taken by vessels bound to Guayaquil. Losing the N.E. Trades between lat. 10° and 8° N., long. 115° and 120° W., they enter a wedge-shaped belt of light southerly and south-westerly winds, then reaching off the Central American coast between 10° N. and 5° S.; passing eastward of the Galapagos, they reach Guayaquil within 20 days, or Salaverry within 25 days, of leaving the N.E. Trades.

Hence, to reach Callao, it is either necessary to stand off for several days, against the full force of the S.E. Trade and Peruvian current, so as to fetch port on the other tack; or, preferably, to work southward close inshore, taking advantage of the land and sea breezes.

Callao to Corinto.—Capt. G. Green, German barque *Elisabeth*, left Callao on January 26, 1889, and steered north-westward, for 60 or 70 miles, and then more northward in order to cross the Equator between 84° and 85° W.; steering thence for Corinto he arrived off the port on February 15. From his experience, and that of others, he recommends vessels to pass about 20 miles eastward of Cocos Island, and thence shape a course for Cape Blanco.

Page 1257.—**Between Mexico, Panama, &c., and Australia.**—Vessels bound to Mexican ports follow the route from Australia to San Francisco till the N.E. Trades are attained, and then make their way for the destined port.

If bound to Panama or Costa Rica, in the southern summer cross 30° S. in about 97° W., and in winter in about 100° W., and pass eastward of the Galapagos. Then steer for the desired port; but from December to April, if bound to Panama, lay the course to pass 40 or 50 miles eastward of Cape Mala.

If bound to Corinto, or ports adjacent, leaving Australia from September to February, pass eastward of the Galapagos, and then make for Cape Blanco, afterwards keeping near the coast. If leaving between March and August, cross 30° S. in 100° to 105° W., pass westward of the Galapagos, and then make for port.

The average voyage from Newcastle, N.S.W., to Panama takes 93 days, and to Acapulco 80 days.

Vessels bound from Mexican ports to Australia, from April to September, steer through the N.E. Trades so as to join the route from San Francisco; or from the end of June may steer direct into the S.E. Trades. From October to February, steer to cross 10° N. in 120° W., and then make the best course through the belt of calms into the S.E. Trades. In March it would be better to cross 10° N. in 142° W.

From Panama, and other Central American ports, vessels must take the shortest course through the region of calms to gain the N.E. or S.E. Trades, proceeding as the winds may favour them.

Page 1258.—**Hong Kong to Callao, &c.**—During the N.E. monsoon (October to April) sailing vessels run down the China Sea, and through Sunda Strait into the S.E. Trades of the Indian Ocean. The first of the westerly winds may be felt in about lat. 30° S., long. 90° E., but vessels will steer much farther southward so as to pass South of Tasmania and New Zealand. The average voyage occupies from 96 to 106 days.

During the S.W. monsoon (May to September) vessels will take the northern route to join the route from Juan de Fuca Strait or California to the Equator, &c.

Page 1264.—**Hakodate to Kobe, &c.**—Vessels bound to Kobe, or ports to the westward, in summer, are advised to proceed by way of the Sea of Japan and Korea Strait. In winter, the outer or eastern route is preferable.

Page 1270.—Astrolabe Bay (not Bank), 1018-19.
Page 1271.—Beale (not Beak) Cape, 407,411.
Page 1272.—Bogoslov Islands, 676.
Page 1273.—Cardero Channel, 497 (not 407). Carmanah, Cape, 393.
Page 1275.—Clarence Strait, 598.
Page 1278.—Discovery Island, 364.
Page 1281.—Gabriola Island, &c., 388 (not 338). Gaspar Rico Islands 961 (not 861).
Page 1284.—Hino misaki and Light, 880.
Page 1287.—Killisnoo, 613.
Page 1291.—Maizuru, 877. Mapia Island, 1024.
Page 1293.—Moji, 793. Montara (not Montana) Point, 237.
Page 1300.—Prince Rupert Harbour, 550.
Page 1304.—Sasebo, or Saseho, 890.
Page 1308.—Swiftsure Bank, 325.
Page 1312.—Wakkauai, 756. Wakamatsu, 793.
Page 1313.—Willapa Bay, 312. Winds, California, Gulf of, 120.

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